F. Ch. f. 59: 179.

THE ANATOMY OF THE Human Bones;

With an Account of

MUSCULAR MOTION,

AND THE

CIRCULATION of the BLOOD:

ALSO OF

Digeſtion and Nutrition:

WITH

A DESCRIPTION of the FOUR SENSES.

Illuſtrated with variety of Copper Plates.

To which is added,

A ſhort and eaſy Method of diſcovering the VIRTUES of PLANTS in curing the Diſeaſes of the *Human Body*.

By GEORGE THOMSON, M. A.

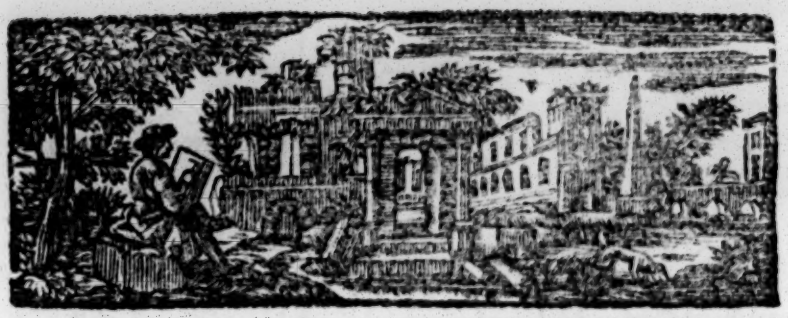
LONDON:

Printed for R. WARE, at the Bible and Sun in *Amen Corner*; A. WARD at the King's-Arms in *Little Britain*; J. OSWALD at the Roſe and Crown in the *Poultry*; and T. HATCHETT, under the *Royal-Exchange*. M,DCC,XXXIV.

781 e 2

MVSEVM
BRITAN
NICVM

4 D 3



To the Right Honourable

WILLIAM CRUICKSHANK, *Esq*;
LORD PROVOST,
William Smith,
William Chalmers,
William Mowat,
Hugh Hay,
} BAILIES.
Alexander Crombie, *Dean of Gild*,
James Morison, *Treasurer*,
And to the rest of the Members of the Town-Council *of* Aberdeen.

My Lord *and* Gentlemen,

NO wonder that dedications flock in upon you, since you are generally known to

be ſuch encouragers and promoters of literature, that every profeſſor of it takes you for his friends.

WHEREFORE moſt writers would, on this occaſion, launch out and attempt to draw your characters, which, however pleaſing this might be to others, would, I am fully confident, be diſagreeable to yourſelves. But, for my part, I ſhall ask pardon for the preſumption of dedicating the following ſheets to your Lordſhip, &c. and only add,

that

that whatever pomp dedications uſually affect, or whatever motives they may proceed from, the ſole intent of this is to aſſure your Lordſhip, &c. that I am, and ſhall be, with great eſteem,

My Lord, *and* Gentlemen,

Your Lordſhip's, &c.

Moſt obedient

Humble Servant,

GEO. THOMSON.

Advertiſement.

MY intention in publiſhing the following ſheets, which are drawn from the moſt celebrated modern authors, has been to ſhew, in a plain, eaſy, and inſtructive way, for the ſake of beginners, and of thoſe who have made no great progreſs in anatomy,

1. *THE* figure, ſituation, connection, *and* uſes *of the* bones *of the* human *body* *, *which are in reſpect*

* Conſult theſe two excellent pieces, *viz.* a *deſcription of the bones of the human body*, and *the anatomy of the human bones*; the former wrote by the learned *Albinus*, and the latter by the learned Mr. *Monro*, both profeſſors of anatomy in the two only famous univerſities we have for phyſic in *Europe*, viz. *Leyden* and *Edinburgh*.

reſpect to it, as a wooden frame is to the whole building. They give ſtrength to the body, ſuſtain all its organs, and keep the animal in all ſituations proper for its functions, by means of their different conformation, ſtructure *and* connexion.

IN ſhort, the exact knowledge of the bones is the foundation *of anatomy; becauſe, without this we can never have a juſt idea of the* ſituation, diſpoſition *and* uſes *of moſt parts of the* human *body, nor, conſequently, underſtand, or cure the diſorders to which they are ſubject. And this knowledge is acquired by a* skeleton, *or a collection of bones, well cleaned and dried, ſo united together, as to repreſent, as juſtly as is poſſible, the na-*

Advertiſement.

natural fabric of the freſh bones. But tho' a ſkeleton comes not perfectly up to the natural ſtructure of the freſh bones, yet it is both very neceſſary and uſeful, to acquire a preliminary idea of the whole natural ſtate of the bony edifice, eſpecially, if we deſire, with eaſe and pleaſure, to reap the fruit of an examination, or demonſtration of the bones in a freſh ſubject *.

* They who cannot come at a ſkeleton may have recourſe to that great work Mr. *Cheſelden* has lately publiſhed, *viz. Oſteographia*, or *the Anatomy of the human Bones*, wherein he has delineated every bone in the human body, as large as the life, and again reduced them to leſſer ſcales, in order to ſhew their connexion with each other. And one may have a better idea from theſe prints, and the ſhort, tho' full account he has given, than from the largeſt and beſt deſcriptions yet extant.

Advertiſement.

2. *I have endeavoured to give an idea of* muſcular motion; *the* motion of the blood; digeſtion *and* nutrition; *the* ſtructure of the noſe; *the* mouth *and* tongue; *the* eye *and the* ear; with the uſes of their parts *.

Laſtly, *I have added a ſhort* method of diſcovering the virtues of Plants in curing the diſeaſes of the human body, *extracted from the ſeveral eſſays of the learned Dr.* Fred. Hoffman; *and to make it generally uſeful, I have ranged both the plants and diſtempers into two ſeparate indexes.*

* For acquiring a full acquaintance with anatomy, the two beſt ſyſtems I know of, are *Veſalius de corporis humani fabrica*, and *Winſlow's anatomical expoſition of the ſtructure of the human body*, lately engliſhed by the ingenious Dr. *Geo. Douglas*, to which I have been very much obliged.

CON-

THE CONTENTS.

SECT. I. *Of the bones in general.* Page 1

SECT. II. *Of the cartilages and ligaments.* 12

SECT. III. *Of the bones of the head.* 15

SECT. IV. *Of the bones of the trunk.* 36

SECT. V. *Of the bones of the upper extremities.* 64

SECT. VI. *Of the bones of the lower extremities.* 90

SECT.

CONTENTS.

SECT. VII. *Of the marks of a female skeleton.* 119

SECT. VIII. *Of the number of the bones in a human body.* 123

SECT. IX. *Of muſcular motion.* 133

SECT. X. *Of the motion of the blood.* 150

SECT. XI. *Of digeſtion and nutrition.* 156

SECT. XII. *Of the noſe.* 166

SECT. XIII. *Of the mouth and tongue.* 173

SECT. XIV. *Of the eye.* 186

SECT. XV. *Of the ſtructure of the ear.* 224

SECT. XVI. *Shewing the uſe of the parts of the ear.* 244

CONTENTS.

A ſhort method of diſcovering the virtues of plants in curing the diſeaſes of the human body. 263

SECT. I. *To diſcover the virtues of plants from their external marks and characteriſtics.* 270

SECT. II. *To diſcover the virtues of plants from their taſte and ſmell.* 278

SECT. III. *To diſcover the virtues of plants from the ſoil in which they grow.* 288

A GLOSSARY.

Abdomen, the cavity of the body from the *diaphragm* to the *os pubis*.

Abductor, a muſcle to draw (a finger) from the other, oppoſite to *adductor*.

Abſorb, to drink, conſume.

Abſtergents, cleanſing.

Abſterſive, cleanſing.

Accelerate, to haſten.

Acetabulum, the ſocket for the head of the thigh-bone.

Acid, ſour, ſharp, oppoſite to *alkali*.

Acrimonious, that which has

Acrimony, ſharpneſs, tartneſs.

Acromion, the upper proceſs of the ſhoulder-bone.

Acute, ſharp pointed.

Adductor. See *abductor*.

Adhere, to ſtick to.

Adheſion, ſticking to, cleaving.

Adnata, the outward coat of the eye.

Ægylops, a tumour or ſwelling in the great corner of the eye.

Æthereal, belonging to

Æther, a fine fluid, ſuppoſed in, and above our groſs air, even as far as the fixed ſtars.

Agitation, brisk motion; philoſophically, it is internal as well as external.

A GLOSSARY.

Alæ, wings.
Alexipharmic, expelling poiſon.
Aliment, nouriſhment.
Alkali, a fixed ſalt from calcined plants, oppoſite to *acid*.
Alternate, by turns.
Alveoli dentium, the ſockets of the teeth.
Amphibious, living both on land and in water, as *Otter*, &c.
Amygdalæ. See *tonſillæ*.
Anaſarca, dropſy between skin and muſcles.
Angina, a tumor in the throat.
Annularis cartilago, a griſtle in form of a ring.
Anodyne, medicine to eaſe pain.
Anterior, ſomething before another.
Anthelminthics } medicines to kill worms.
Antielminthics }
Antihelix, part of the ear, oppoſite to *helix*.
Antiſcorbutic, againſt the ſcurvy.
Antitragus, a protuberance of the ear, oppoſite to *tragus*.
Antrum, a den or cave.
—— *genæ*, the hollow of the cheek.
—— *maxillæ ſuperioris*, a large cavity in the inſide of the maxillary bone, which opens by a ſmall hole into the noſtrils.
Anus, the fundament.
Aorta, the great artery from the heart.
Apophyſis, the protuberance of a bone.
—— *gracilis*, a ſlender protuberance.
Apparatus, medicines, inſtruments, *&c.* to be made ready before an operation.
Appendix, when a bone grows to another by contiguity.
Aperient, opening.
Aponeuroſis, the tendon or tail of a muſcle.
Aqueous humour, one of the humours of the eye.
Artery, a canal that receives the blood from the heart.
Arthrodia, an articulation or joining.
Arthrodial, belonging to the ſame.
Articulation, joining together.

Aſpera

A GLOSSARY.

Aſpera arteria, the wind-pipe.

Aſſimilate, *Aſſimilation*, } to change the food into the body fed.

Aſtragalus, one of the bones of the foot.

Aſtringent, medicines that bind up.

Atlantic, belonging to

Atlas, the firſt vertebra of the neck.

Atmoſphere, the lower region of our air round the earth.

Attenuaters, medicines thinning the blood, *&c.*

Attitude, placed in good order, to the beſt advantage.

Attollens. See *ſuperbus*.

Attraction, drawing to.

Attrition, grinding, wearing.

Auricle of the heart, an orifice thereof.

Axis, an axle-tree.

Balſamic, balſam like.

Baſilare os. See *Sphenoides*.

Bezoardic medicines, cordials.

Bilious, full of bile, choler.

Brachial, belonging to the arm.

Bronchia, pipes in the lungs from the wind-pipe.

Bronchotomia, opening the wind-pipe, a chirurgical operation.

Cachexy, ill ſtate of body, indiſpoſition of fluids.

Cæteris paribus, in the like caſe.

Calcine, to burn.

Calcination, burning.

Calcis os, the bone of the heel.

Calculous caſes, where there is a ſtone in the bladder.

Calculus, a ſtone, ſtone in the bladder, a computation.

Calva, *Calvaria* } the upper part of the head.

Canal, a paſſage, pipe, through which fluids run.

Canini dentes, the dog-teeth, the corner teeth.

A GLOSSARY.

Canthus major, the inward corner of the eye.
Canthus minor, the outward corner of the eye.
Capillamenta, ſmall hairs or threads.
Capillary, hair like.
Capſula, [in *Anatomy*] a membrane or skin, [in *Botany*] ſeed-veſſels.
Caput, the head.
Carminative, medicines that expel wind.
Carotides, the name of two arteries.
Carpus, the wriſt.
Cartilage, a griſtle
Cartilago lunata, a cartilage between the bones of the leg.
Caruncle, a little piece of fleſh, ſometimes natural, ſometimes preternatural.
Catarrh, a defluxion of ſharp *ſerum* from the glands about the head and throat.
Cathartics, purging medicines.
Cavernous, full of hollow places.
Cavity, hollowneſs.
Cauſtic, burning medicines.
Cauterie, burning the fleſh.
Cellula, a little cell.
Centre of motion, middle of wheel, *&c.*
Cephalic, good for the head, belonging to it.
Ceratoglossus, muſcle of the tongue that draws it back.
Cerebellum, the hind part of
Cerebrum, the brain.
Cerebri galea, the skull.
Cervical, belonging to
Cervix, the neck.
Chaos, a confuſed heap of things.
Character, quality, that by which it is known.
Characteriſtic, belonging to a quality, a mark or ſign.
Choroides plexus, the foldings of the carotid artery.
Chronic diſeaſe, of long continuance.

Chyle

A GLOSSARY.

Chyle, that juice which the food is immediately converted into by digeſtion.

Ciliare ligamentum, a collection of ſmall ſlender fibres round the cryſtalline humour.

Cilium, the edge of the eye-lid whence the hairs grow.

Circulate, to move round.

Clavicle, or channel-bone, the long bone that ties the top of the ſhoulder to the breaſt.

Coagulated, reſembling

Coagulum, the thick part of the blood that ſwims in the *ſerum* when cold.

Coccyx, three or four ſlender bones joined to the exrtremity of the *os ſacrum*.

Cochlea, the inner part of the cavity of the ear.

Cohere, to ſtick together.

Coheſion, ſticking together.

Collateral, that reſts on the ſides.

Compreſs, to ſqueeze cloſe.

Compreſſion, preſſing together.

Concha, the winding within the ear, *&c.*

Concave, hollow.

Concavo-convex, hollow on one ſide, and jutting on the other, like a watch-glaſs.

Condylus, a joint, knuckle, or the knobs on bones.

Congeal, to freeze or grow thick.

Conglobata glandula, a gland ſubſiſting by itſelf.

Conglomerata glandula, is that which conſiſts of ſeveral glands.

Conjunctiva tunica, the outer coat of the eye.

Connect, to join, knit.

Conſolidate, to cement together.

Contact, bodies touching each other.

Contiguity, touching, the nearneſs of two bodies.

Contiguous, which touch.

Contraction, ſhrinking, or drawing together.

Contractores alæ naſi, muſcles which draw the noſe down.

Contuſion, beating, or bruiſing.

A GLOSSARY.

Convex, globular; anatomiſts call it protuberant.
Convoluta oſſa, the lower ſhelves of the noſe.
Convulſion, a motion of the muſcles independent on the will.
Coracoides, a proceſs in the ſhoulder-bone, in the ſhape of a crow's-bill.
Coronalis ſutura, a ſuture on the crown of the head.
Corone, an acute proceſs of the lower jaw, formed like a beak.
Corroborate, to ſtrengthen.
Coſtæ, the ribs.
Cotyle or *acetabulum*, the ſocket of the hip-bone, the *cotyloid* cavity.
Coxendix, the hip bone.
Cranium, the skull.
Cribroſum os. See *ethmoides*.
Criſta, a twiſted, crooked, ſpiral eminence in the middle of the ſpine of the *omoplate*.
Crotaphite muſcle, the temporal muſcle.
Criſta galli, part of the *os ethmoides*, reſembling the comb of a cock.
Crudity, rawneſs.
Crura, legs, alſo the two beginnings of the brain.
Cryſtalline humour, the tranſparent humour of the eye.
Cubitus, that part of the arm from the elbow to the wriſt, alſo the bone in that part of the arm.
Cuneiformia oſſa, wedge-like bones.
Curve, crooked, bent, uneven.
Curvature, crookedneſs, bending.
Cylinder, a ſolid body, equally round in its length, and its ends equal circles.
Cylindrical, in form of, or belonging to a cylinder.
Cylindro-elliptic cylindroid; a ſolid figure with elliptic baſes, parallel, and alike ſituated.

Deglution, ſwallowing.
Denſe, thick.

Denſity,

Denſity, thickneſs.

Dentes, the teeth.

Deobſtruent, a medicine that removes obſtructions.

Deprimens, a muſcle that pulls the globe of the eye downwards.

Determinate, determined or defined.

Devoid, for void.

Diametre, a right line that paſſes through the middle of any figure from one corner to another.

Diaphoretic, medicines cauſing ſweat.

Diaphragma, the tranſverſe muſcle that divides the body into two cavities, *viz.* the *thorax* and *abdomen*; the *midriff*.

Diarthroſis, a looſe joining of bones, fit for motion.

Diaſtole, uſed for the dilatation of the heart, artery.

Diffuſe, ſpread.

Digeſter, a veſſel invented by Dr. *Papin* to diſſolve bones, *&c.*

Digeſtion [animal], diſſolution of food in the ſtomach for nutriment to the body.

Digital, belonging to a finger.

Dilate, to extend or grow bigger.

Dilatation, when a thing takes more ſpace than it did.

Diminutive, a word made from another that ſignifies leſs, as from ſack, ſatchel.

Diploe, a thin and ſpongy ſubſtance made of ſome bony fibres between the two tables of the skull.

Director, a hollow inſtrument to guide the inciſion knife.

Diſcutient, medicines, diſſolving and driving away groſs matter.

Diſlocate, to put out of joint.

Diſlocation, when a bone is out of its place.

Diſtort, to pull awry, on one ſide.

Diverticulum, by-paſſage.

Diuretic, medicines, that purge by urine.

Dorſal,

Dorſal, belonging to
Dorſum, the back.
Duct, a channel, or paſſage.
Dura-mater, a membrane which covers the brain.

Ethmoidal, ſieve-like.
Elaſtic force, exploſion of ſpirits, as in cramps.
Elaſticity, ſpringineſs.
Elongation, an imperfect luxation, when the ligament is relaxed.
Ellipſis, an oval.
Elliptical, in the form of an egg.
Emaciate, to make lean.
Emetic, medicines that cauſe vomiting.
Emmenagogics } medicines, provoking the courſes in
Emmenagogues } women.
Emollient, that ſoftens and diſſipates tumours.
Enarthroſis, a ſpecies of articulation, is, when a round head of a bone is received into a deep and round cavity of another.
Epidermis, the *cuticula*, or ſcarf-skin.
Epiglottis, the little cartilage that covers the wind pipe.
Epiphyſis. *See* appendix.
Epiſtrophæus, the firſt *vertebra* of the neck, that turns round on the axis or ſecond *vertebra*. See *Atlas*.
Erect, upright.
Ethmoides os, a bone of the skull like a ſieve.
Excite, to ſtir up.
Excreſcence, what is ſuperfluous growing on a body.
Excretion, what is voided from the blood, body, &c.
Excretory, ſmall ducts to ſeparate ſuperfluous matters from the juices.
Expanſe, ſpread.
Expanſive, ſpreading.
Extenſor, that extends, ſtretches forth.
Extravaſated, that is burſt out of its proper veſſels.

Fabric

A GLOSSARY.

Fabrick, building; the human body ſometimes ſo called.
Facilitate, to make eaſy.
Faſciculus, a bundle of any thing.
Fauces, the upper part of the gullet.
Femoris os, the thigh-bone.
Feneſtra, two holes in the inner cavity of the ear, a window.
Fibra, a
Fibre, hair, ſmall ſtring.
Fibula, the leſſer bone of the leg.
Filament, ſmall thread.
Fiſſure, a bone ſplit lengthways.
Fiſtula lachrymalis, a diſeaſe of the eye.
Flection, bending.
Flexible, that may be bent.
Flexor, a muſcle ſerving to bend any part.
Fluid, eaſily ſeparable, as water, *&c.*
Fœtus, a child not born.
Foramen, an orifice.
Foramen narium, the noſtrils.
——— *opticum*, a hole in the *os ſphenoides*, by which the optic nerve paſſes.
——— *ovale oſſis occipitis*, the great hole of the *os occipitis*, through which the *medulla ſpinalis* paſſes.
Foramina lacera, are two holes in the *os ſphenoides*, by which the third pair, fourth pair, firſt branch of the fifth pair, and the ſixth pair of nerves paſs.
Foſſa, the *rima*, *pudendum muliebre*, a chink.
Foſſula, a diminutive of *foſſa*.
Frænulum, the ligament of the tongue, a diminutive of
Frænum, a bridle, the ligament of the *penis*.
Frontis os, the fore part of the skull.
Fulcrum, a prop, or ſtay.
Fungus, ſpungy fleſh in a wound; alſo a muſhroom.

A GLOSSARY.

Gaſtrocnemius externus } two muſcles that extend the
Gaſtrocnemius internus } foot.

Geniogloſſi, a pair of muſcles ariſing from the lower part of the chin, and inſerted into the baſis of the tongue.

Ginglymus, a kind of articulation, when a bone both receives and is received.

Gland, a kernel in the fleſh.

Glandula, conglomerata. See *conglomerata glandula.*

Globular, round like a bowl.

Gloſſocatochos, an inſtrument to depreſs the tongue.

Gloſſo-ſtaphylinus, Valſalvæ, a muſcle of the *uvula* that moves it ſideways.

Glutinous, ſticking, clammy.

Gomphoſis, a kind of articulation where the bone is drove in like a nail, as the teeth in the jaw.

Gonorrhœa, the running of the reins, the flowing of the ſeed without any erection of the *penis*.

Gravity, weight, that whereby bodies tend to the centre of the earth.

Groove, a hollow channel cut in wood, *&c.*

Helix, the circular or ſpiral rim of the ear.

Hemiſphere, half the globe.

Horizon, where the earth and sky ſeem to meet.

Horizontal, belonging to the horizon.

Humeri os, the bone in the upper part of the arm.

Humilis. See *deprimens.*

Hyoides
Hypſiloïdes } the bone of the tongue.

Ilium os, the upper part of the bone called *os innominatum.*

Immenſe, unmeaſurable, very great.

Impoſthume, a gathering together of corrupt matter.

In-

A GLOSSARY.

Incide, to cut.
Inciſores dentes, the fore-teeth, cutters.
Incraſſate, to thicken.
Incumbent, lying upon.
Incus, the anvil, or little bone of the ear that the *malleus* ſtrikes upon.
Indent, uneven, tooth-like.
Inflection, bending.
Infundibulum, a funnel, whence many parts in the human body, having a reſemblance thereto, are ſo called, as *infundibulum cerebri*, &c.
Innominatum os, the bone adjoining to the *coccyx*, not having any name.
Inſert, to put, or bring in.
Inſertion, a grafting, or planting in.
Interrupt, to take of, or ſtop.
Interſtice, a diſtance, or ſpace between.
Intervene, to come between, unlooked for.
Inteſtines, guts.
Inteſtinum rectum, the ſtrait gut.
Inverecundum os. See *os frontis*.
Inverſe, when the antecedents are turned into conſequents, and the contrary.
Iris, the circle about the pupil of the eye.
Iſchium os, the hip-bone.
Jugale os. See *zygoma*.
Jugular, veins, &c. of the throat.

Labyrinth, the ſecond cavity of the ear.
Lacerated, torn.
Lachrymale os. See *os unguis*.
Lambdoides, a ſuture of the skull.
Lamina, a ſcale or plate.
Languid, weak.

A GLOSSARY.

Larynx, the top of the wind-pipe.
Lateral, ſide-ways.
Lens, the cryſtalline humour of the eye; alſo an optic-glaſs.
Lenticular, belonging to a lens.
Lever, an inflexible right line, ſupported by a ſingle point on a prop, and uſed for raiſing of weights.
Ligamentous, belonging to
Ligament, a tie.
Linea mediana, a ſeam down the middle of the tongue.
Lithiaſis, the generation of ſtones, a perſon that has the ſtone.
Lobe, the tip of the ear, alſo diviſions of the lungs and liver.
Longitudinal ſuture, from one ſide the skull to the other.
Lubricate, to make ſlippery.
Lumbar, pertaining to the loins.
Lunare os, the ſecond bone of the *carpus*.
Lymphatic veſſels } are ſlender, pellucid tubes, convey-
Lympheducts } veying a tranſparent fluid, like water, to ſeveral veins.

Machine, an engine.
Magnum os, the largeſt bone of the *carpus*.
Malæ oſſa, the cheek-bones.
Malleolus internus, the inner ancle.
Malleus, the little bone that ſtrikes upon the *incus* in the ear.
Mammæ, the breaſts of a woman.
Margin, the brim, or edge of any thing, as the margin of a book.
Maſtication, chewing.
Maſtoide. See *proceſſus mammiformis*.
Matrix, the womb.

Maxilla,

A GLOSSARY.

Maxilla, the jaw.
Maxillaris glandula, a gland near the jaw.
Meatus, a paſſage.
Meatus auditorius, paſſage into the ear.
Mechanical affections, ſuch properties as ariſe from the figure, bulk, or motion of the parts.
Meditullium. See *diploe*.
Medium, means, alſo place.
Medulla cerebri, the marrow of the brain.
——— *oblongata*, the beginning of the ſpinal marrow.
——— *ſpinalis*, marrow of the back.
Medullary, belonging to the marrow.
Membrane, a web of ſeveral ſorts of fibres interwoven together, for the covering of the muſcles, bowels, *&c.*
Memoriæ os, the occipital bone.
Metacarpi oſſa, the four bones of the hand next the *carpus*.
Metatarſal, belonging to
Metatarſus, the middle of the foot.
Microſcope, a glaſs to look on the ſmalleſt objects.
Mineral, dug in a mine.
Moiſture, wet.
Molares dentes, the grinders.
Monopetalous, flowers all of a piece.
Mucilaginous, ſlimy.
Mucus, the ſlimy liquor, or moiſture flowing into the noſtrils.
Muſcular, belonging to a
Muſcle, a bundle of threads faſtened together, by which motion is performed.
Muſculus rectus, the ſtrait muſcle of the *abdomen*.

Muſ-

Muſculus orbicularis, a muſcle that ſhuts both eye-lids, and a muſcle that draws both lips together.

——— *ſuperbus*, a muſcle that pulls the globe of the eye upward.

Myope, ſhort ſight.

Narcotics, medicines which produce ſleep.

Nares, the noſe.

Naſal, belonging to the noſe.

Naſi oſſa, bones of the noſe.

Nature, the diſpoſition of a body, the eſſence and attributes of a thing.

Natural ſituation, the place nature has given to things.

Naviculare os. See *ſcaphoides*.

Nerve, ariſing from the brain, whereby ſenſation and ſpontaneous motion are conveyed to the body.

Neurotics, medicines againſt diſeaſes of the nerves.

Nitre, volatile ſalt of the air.

Nitrous, full of nitre.

Nothæ coſtæ, the falſe ribs.

Nutrition, nouriſhment.

Nutritious, nouriſhing.

Oblique, awry, crooked.

Obliquus ſuperior, a muſcle of the head.

——— *major oculi*, a muſcle, drawing the eye forward, and turning its pupil downward.

——— *minor oculi*, drawing the globe of the eye forward, and turning its pupil upward.

Oblong, a ſquare figure, longer one way than another.

Obſtruction, ſtoppage, hindrance.

Obtuſe, blunt.

Occipital, belonging to the hinder part of the head.

Occipitis os, the bone of the head behind.

Odoriferous, belonging to

Odour,

A GLOSSARY.

Odour, ſmell, ſweet perfume.
Oeſophagus, the gullet.
Olecranon, the great proceſs of the *ulna*.
Olfactory nerves, in the noſe for ſmelling.
Olla capitis, the ſkull.
Omoplata, the ſhoulder-blade.
Optic, belonging to ſight.
Orbicular, round.
Orbiculare os, a bone of the ear; and alſo of the *carpus*.
Orbiculus, the tip of the noſe.
Orbiter externus, a hole in the cheek-bone.
——— *internus*, a hole in the coronal bone.
Organ, inſtrument.
Organ of ſenſe, where the ſenſation is placed; in viſion, the eye; hearing, the ear, *&c.*
Orifice, the opening or mouth, as of the ſtomach, of a wound, of a vein.
Origin, beginning.
Os occipitis, the occipital bone.
Officula auditus, bones of the ear.
Oſſification, the time that cartilages, *&c.* begin to
Oſſifie, grow bony, change to a bone.
Oval, a figure repreſented by an egg.

Palati os, a bone in the hinder part of the mouth.
Palpebra, eye-lid.
Panniculus, membrane.
——— *carnoſus*, a membrane that covers the body of other animals between the skin and *membrana adipoſa*, only in man's face.
Papilla, a teat, breaſt.
Papillary, belonging to the breaſt.

Para-

Parallel, equal, =.

Parietalia oſſa, bones on the ſides of the skull.

Parotis glandulæ, glands under the ear.

Patella, the knee-pan.

Pelvis, the baſon of the kidneys, *&c.*

Penis, the yard.

Pennæ. See *alæ*.

Pericranium, the membrane that covers the skull.

Perioſteum, the membrane which covers the bones.

Permanent, durable.

Per ſaltum, at once, by a leap.

Petroſum os, temple-bones.

Per ſe, by himſelf, by itſelf.

Phalanx, *Phalanges* } ſmall bones of the fingers and toes.

Phænomena, appearance.

Pharynx, the upper part of the gullet.

Pharyngæus, a muſcle of the *pharynx*.

Pia-mater, the inmoſt cover of the brain.

Pituita. See *mucus*.

Pixidis os, the occipital bone.

Pleura, the membrane that lines the cavity of the *thorax*.

Pores, giving a paſſage to the hair, ſweat, *&c.*

Porous, full of pores.

Practicable, that which may be reduced to

Practice, actual exerciſe.

Presbytia, when one ſees better at a diſtance than near.

Preternatural, not natural.

Proceſſus, a proceſs, or protuberance of a bone, *&c.* of which there are

Proceſſus aliformis, wing-like proceſs.

Proceſſus coracoides, from reſembling a raven's bill.

——— { *mammiformis* / *mammillaris* / *maſtoides* } teat-like.

——— { *lithoides* / *petroſus* } ſtony.

——— *ſtyloides*, pen-like.

——— *zygomaticus*, like a yoke, *jugalis*.

Prominence / *Protuberance* } the jutting out of a thing.

Proportion, agreement, likeneſs.

Proræ os, the occipital bone.

Pterygoide, wing-like, a proceſs.

Pubis os, the inferior and fore part of the *os innominatum*, which ſee.

Pulmonary artery, a veſſel that conveys the blood from the heart to the lungs.

Puncta lachrymalia, holes in the great corner of the eye, one in each ſide, leading to the *lachrymal bag*, affording paſſages for the tears into the noſe.

Puncture, a wound by the point of an inſtrument.

Puppis, a vein behind the head.

Putrefaction, corruption.

Pyramid, ſpire-like.

Pyramidal, pyramid-like.

Quadrangular, four-ſided.

Quadrupede, a four-footed beaſt.

Radius, the leſſer bone of the arm.

Ranulæ / *Ranulares* } branches to the tongue from the jugular vein.

A GLOSSARY.

Recede, to go back or retire.
Rectus ſuperior, a muſcle of the eye.
Reflect, to break back, to ſend back.
Refract, to beat back, to reſiſt.
Refracted, broken back, as a ray of light refracted.
Regurgitate, to ſwallow again.
Relative, related, of kin.
Relaxed, looſened.
Reſpiration, the alternative dilatation and contraction of the *thorax*, whereby the air is received in, and driven out of the lungs.
Retina, tunica, a coat of the eye.
Rima, a fiſſure or chink, a cleft.
Robuſt, ſtrong, oak-like.
Rotation, turning like a wheel.

Sacrum os, the foundation of the back-bone.
Sagittal ſuture, a ſeam in the skull reaching from the lambdoidal to the coronal ſuture.
Saliva, ſpittle.
Salival, belonging to ſpittle.
Scabrous, rough, rugged.
Scaphoides, a bone of the *tarſus*.
Scapula, the ſhoulder-blade.
Sclerotica. See *tunica cornea*.
Scutella capitis, skull.
Scutiformis, cartilage, of the *larynx*, in the form of a ſhield.
Secrete, to ſeparate.
Secretion, ſeparation.
Semicircle, half a circle.
Semi-oval, half an oval.
Senſorium, organ of ſenſe.
Senſus communis os. See *os frontis*.

Seps,

A GLOSSARY.

Seps, *ſeptum*, a diviſion, as

Septum cordis, diviſion of the heart, from *ſeps* an hedge.

Seroſity, reſembling

Serum, whey, or the watry part of the blood.

Septum narium, the divider of the noſtrils.

Seſamoidea oſſa, very ſmall bones in the articulation of the hands and feet.

Sigmoides, or *ſemilunaris*, a cavity in the *ulna*; alſo the valves of *arteria pulmonalis & aorta*.

Sincipitis oſſa, bones of the upper part of the head, the ſame as the *oſſa parietalia*.

Sinus, a cavity or hollow place between the veſſels.

Soake, to ſteep, or infuſe in.

Soporiferous, cauſing ſleep.

Species, ſorts.

Specific, particular.

Sphenoides os, a wedge-like bone, in the baſis of the skull.

Spheno-maxillaris. See *foramina lacera*.

Spheno-palatinus, a muſcle of the *epiglotis*, which ariſes from the *os ſphenoides*, and is inſerted in the hind part of the *epiglottis*.

Spine, the back-bone.

Spina dorſi, the protuberance of the *vertebræ* toward the hind part.

Spiral line, ſuch as a rope coiled up.

Spongioſa oſſa. See *turbinata oſſa*.

Spongy, porous, like a ſponge.

Squamoſa ſutura, when the bones are joined aſlope like ſcales, go one over another.

Stapes, a ſmall bone in the ear.

Sternum, the breaſt-bone.

Stimulate, to ſpur, or move on.

Stimulus, a ſpur or goad.

Strangury, ſtoppage of urine, when it only comes drop after drop.

Stratum ſuper ſtratum, lay upon lay.

Structure, the reſult of all the qualities of matter in any body, which diſtinguiſh it from all others.

Style, a pencil.

Styloglossi, a pair of muſcles that lift up the tongue.

Styloides, a proceſs of the *os temporum*, reſembling a pencil.

Subaſtringent, leſs binding, or more mild.

Subterraneous, under the earth.

Sulphur, brimſtone.

Sulphureous, belonging to ſulphur.

Superbus, one of the ſix pair of muſcles of the eye, which lift it upward.

Supercilium, eye-brow.

Sutures, the ſeams of the skull.

Symphyſis, that articulation of the bones that has no manifeſt motion.

Synarthroſis, an articulation that has a manifeſt motion.

Synchondroſis, articulation of a joint by an intervening griſtle.

Syſtem, compoſition, the world ſo called, being compoſed of all things.

Syſtole, contraction of the heart.

Talus, a bone of the heel.

Tapes, or *tapetum*, tapeſtry.

Tarſus, the ancle.

Temporum oſſa, the bones of the temples.

Tendinous, belonging to

Tendon, the extremity of a muſcle, whereby the voluntary motion of the members is chiefly performed.

Tene-

A GLOSSARY.

Teneſmus, a continual deſire of going to ſtool.
Terebinthinous, reſembling
Terebinthina, turpentine.
Teſta capitis, *Theca* } skull.
Texture, compoſure, frame.
Thorax, the middle cavity of the body, the breaſt.
Thyroides cartilago, a cartilage of the *larynx*.
Tibia, ſhank-bone.
Tone, condition, ſound.
Tonſillæ, almonds of the ears.
Trachea. See *aſpera arteria*.
Tragus, a little eminence of the ear.
Trapezoides os, or *trapezium*, a ſmall bone of the wriſt.
Traumatic medicine, a vulnerary.
Trephine, *Trepan* } inſtrument to open the skull.
Triangulare os, the little bone between the lambdoidal and ſagittal ſuture.
Triquetra oſſa, three-cornered bones.
Trochanter, two proceſſes in the upper part of the thigh-bone.
Trochlea, the griſtle through which one of the tendons that move the eye paſſes contracted.
Trunk, the body without limbs; alſo of a tree.
Tuberoſity, the bunching out of ſome parts of the body; alſo full of knots and bunches.
Tunica, a little coat, chiefly of the eye.
Tunica cornea, the horny coat of the eye.
Turbinata oſſa, the inferior *lamellæ* of the noſe.

Valves, are little, thin, membranous ſubſtances diſcovered in ſeveral veſſels of the body, which, like fold-

folding doors, open and give free paſſage to the fluids moving one way, but will not ſuffer them to return.

Vagina, a ſheath, the neck of the womb.

Vena cava, the great vein.

Ventricle, the ſtomach.

Vermifuge, worm-deſtroyer.

Vertebra dentata. See *epiſtrophæus*.

Vertebræ, the chain of bones reaching from the head to the *os ſacrum*; they are twenty four in number.

Vertebral, belonging to the *vertebra*.

Verticillate plants, when the flowers grow in whirls about the joints.

Vertex, the top of the head, or of any thing.

Veſtibulum, a cavity in the bone of the ear, called *os petroſum*.

Vibrate, to ſwing, like the pendulum of a clock.

Virulent, poiſonous.

Viſcera, the bowels.

Viſcid, tough.

Vitreous, reſembling

Vitrum, glaſs.

Ulna, the great bone of the lower part of the arm.

Unciforme os, a bone of the *carpus*.

Unguis os, a little thin bone lying in the great angle of the orbit of the eye, and has a hole in which the *lachrymal* bag lies.

Uniform, of one form, regular, even.

Univerſal, general, extending to all.

Volatile, flying.

Vomer, a bone of the noſe in form of a plough-ſhare.

Uvea, one of the coats of the eye reſembling the skin of a grape, whence it has the name.

Vulnerary, medicines for wounds.

A GLOSSARY.

Xiphoides cartilago, a griſtle of the breaſt reſembling a ſword.

Zootomia, anatomy of animals.
Zygoma os, a bone of the upper jaw.
Zygomatic muſcle, of the face.

SECT.

SECT. I.

Of the BONES *in general.*

THE *Bones* are firſt ſoft fibres, till, by the addition of a matter, ſeparated from the blood, they grow to a cartilage, and then a perfect *Bone*: this change is neither effected in a ſhort time, nor at once begun in all the parts of the ſame *Bone*. Flat *Bones* having their fibres directed to all ſides, begin to oſſify in a middle point; but thoſe, whoſe fibres are nearly parallel, begin in the middle of each fibre; and the cylindrical *Bones*, in a middle ring, from which they ſhoot By the continual addition of the oſ-

oſſifying matter, the *Bones* increaſe, till their hardneſs reſiſts a farther extenſion; and becauſe their hardneſs increaſes in proportion to their growth, therefore the increaſe of their growth becomes ſlower and ſlower till they ceaſe to grow; and in old or weak people, they likewiſe decreaſe, as well as the fleſhy parts, * but, becauſe of their hardneſs, not ſo faſt.

BONES

* MR. *Cheſelden* gives a very good reaſon for this his aſſertion; that learned Gentleman ſays. Though I think it would be difficult to prove this, yet the poſſibility of it at leaſt will ſufficiently appear from the following caſe. A Soldier, from a ſhot in his left groin, had the head of the *Os Femoris* broke, part of which came away through the wound, upon which the limb waſted, and he dying of an *Anaſarca* about a year after, I found the *Os Femoris* waſted about an inch in length, but ſo much in its thickneſs, that when they were both dried and ſawed lengthwiſe through the middle, the emaciated *Bone* weighed thirty grains leſs than half the weight of the other Thigh-bone. From the appearance of this Man, and the firm connection of all the *Bones* with the epiphyſes, I am perſuaded he muſt have done growing before he received this wound; therefore, unleſs he was taken lame into the ſervice, which cannot be ſuppoſed, this *Bone* muſt have waſted about thus much in that time.

BONES without motion, as thoſe of the skull, &c. alſo *Bones* with their epiphyſes, when they meet, preſs into each other, and form ſutures, which ſoon diſappear in thoſe that join, while their oſſific matter is ſoft; but thoſe that grow harder before they meet, preſs more rudely and make more uneven ſutures, ſome of which in the skull laſt to the greateſt age; and often the oſſific matter not flowing far enough to complete a *Bone*, the uncompleted part has an oſſification begun in its center, and is formed into a diſtinct *Bone*. But the ends or ſides of *Bones* intended for motion, are hindred from uniting, by the cartilages which cover them, and when theſe cartilages are deſtroyed, they readily unite.

THE *Bones* have two kinds of prominences; the one a continued part of the *Bone*, jetting above its plane ſurface, for the more commodious inſertion of the muſcles, *&c.* called apophyſis;

the other an additional *Bone*, growing to another by contiguity being more ſoft and porous than the other, and called an epiphyſis, or appendix.*

THIS epiphyſis determines the growth and figure of the *Bones*, for, if they were not ſtopped, they would ſhoot out and grow more ragged than the edges of *Bones* joined by ſutures.

THE fibres of *Bones* are connected to each other by a ſtrong attraction like the particles of matter in contact; but this coheſion of fibre to fibre is not equal to that in the parts of a fibre, though very near, for if it was, a *Bone* would not then be a ſtructure of fibres, but one uniform maſs, like that of pure metal, the coheſion of the parts of which are every way alike.

THE

* If the protuberance be round, it is called the *caput*, under which is the *cervix*; if flat, *condylus*; if ſharp, *corone*, *ſtyloides*, *coracoides*, &c.

THE texture of the *Bones* when firſt formed, is every where looſe and ſpongy; but as they increaſe, they become in many places compact and denſe, which, in a great meaſure, reſults from the preſſure of the bellies of the muſcles, and other incumbent parts, as appears from impreſſions made on the ſurfaces of the *Bones*, and the rough ſpines that riſe on the *Bones* in the interſtices of the muſcles, which are remarkable in the *Bones* of hard labouring men. In thoſe parts of the flat *Bones*, but little preſſed, the outer *laminæ* only become compact and denſe, and the middle part remains ſpongy; but where the preſſure is ſtrong, they become one denſe body; and this preſſure is ſo effectual, that ſome parts of the *ſcapula*, and the middle of the *ilium*, are uſually thinner in an adult, than in a child before its birth. The cylindrical or round *Bones*, being moſt preſſed in their middle, are, there, very hard and ſtrong, while their extremities grow ſpongy, and dilate into larger heads, which

make ſtronger articulation, and give more room for the origins and inſertions of the muſcles, by removing their axis farther from the center of motion, and increaſe the power of the muſcles.

ALL the *Bones*, except ſo much of the teeth as are without the ſockets and thoſe parts of other *Bones*, which are covered either with a cartilage, or where muſcles or ligaments ariſe, or are inſerted, are covered with a fine membrane, which, upon the skull, is called *pericranium*, elſewhere *perioſtium*,* one uſe of which is for the muſcles to

* This membrane is ſaid to be exceeding ſenſible of pain, which, I ſuppoſe, is imagined from the pain that a blow on the ſhin gives: but it ſhould be conſidered how much greater the contuſion is in that caſe from its lying upon a hard body; for this is certain, that when we cut this membrane, or ſeparate it from the Bone, as we do, to prepare for the operation of the *Trephine*; the patient never diſcovers any extraordinary uneaſineſs, and that great pain which is ſometimes felt at the ſawing the Bones, or a Bone in ampulation, is when the teeth of the ſaw touch the great nerves that always lie near the Bones, and not from the *perioſtium*; for, if it proceeded from that, this complaint would be more conſtant, and at leaſt as great at the firſt ſetting on of the ſaw, or at the leaſt ſtroke, as at any other time. Mr. *Cheſelden*.

to ſlide eaſily upon, and to hinder them from being lacerated by the roughneſs and hardneſs of the *Bones*.

EVERY cylindrical *Bone* has a large middle cavity, containing an oily marrow, and a great number of leſſer cells toward their extremities, which contain a bloody marrow; this marrow is in all ſpongy cells of *Bones*. The uſe of the oily marrow is to ſoften and moiſten the ſubſtance of the *Bones*, and to prevent their being dry and brittle; and the bloody marrow * is to make ſlippery the articulation of the *Bones*, and hinder their ends from being worn or over-heated with motion; likewiſe to moiſten the ligaments whereby they are tied to each other: in which it is aſſiſted by mucilaginous glands found in all the articulations of the *Bones*.

* HAD this Marrow, as the ingenious Mr. *Cheſelden* very well remarks, been of an oily ſubſtance, it would not only have made the ends of the *Bones* too ſoft and ſlippery, but the ligaments too ſupple and lax; and for this reaſon there is leſs of the oily Marrow and more of the bloody in young *Bones* than in old.

DR. *Havers* divides the blood-veſſels of the *Bones* into nutritious and medullary, the one furniſhing matter for the nutrition, the other for the lubrication of the *Bones*. The chief of the nutritious enter the ends of the *Bone*, *viz.* the arteries at one end, and the veins at the other. The medullary commonly enter the ſides of the *Bone*, and that obliquely; but both by the ſame *foramen*.

THE medullary oil is diſpenſed from the cavity where it is depoſited throughout the whole ſubſtance of the *Bone*; paſſing firſt through tranſverſe pores of the firſt internal *laminæ* into the longitudinal ones; where it proceeds till it finds other tranſverſe pores, when it alters its courſe again, and extends further: thus it paſſes alternately through and between the plates, till it is diffuſed throughout. This is the method of its conveyance in the *Bones*, the plates whereof are contiguous: but where the plates are at a diſtance, as in *Bones* that

that have no great cavity, the ſmall caverns above mentioned contain medullary glands; whence the plates have the benefit of the marrow without the former method of conveyance.

THE *Bones* are generally bigger at their extremities than in the middle, that the articulations might be firm, and the *Bones* not ſo eaſily diſlocated. To render the middle of the *Bone* ſtrong, ſo as to ſuſtain its allotted weight, and reſiſt accidents, the fibres are there more cloſely connected, and ſupport one another; to which may be added, that the *Bone*, being hollow, is not ſo eaſily broken as if it had been ſolid and ſmaller: for, of two *Bones* of equal length, and of a like coheſion, the ſtrength of the one will be to the ſtrength of the other, as their diameters.

To demonſtrate this, ſuppoſe Fig. 1. Plate XI. and 2. to be two *Bones* of the ſame length, and their abſolute force of coheſion equal, but their diameters

Z, *y*, unequal. Let the extremity A be fixed, put the *fulcrum* F under their middle: to the end B of the larger hang the weight P, and to the leſſer the weight P. The diſtances *x*, *x*, of theſe from the *fulcrum* are by ſuppoſition equal: the proportions will then ſtand thus, P : R : : Z : *x* and P : R : : *y* : *x*, out of which we find P : P : : Z, *y*, that is, the relative weights, which are equal to the reſiſtance, or ſtrength of each Bone, are as the diameters of theſe Bones.

THE *Bones* are joined together, according to the various purpoſes they are to ſerve; ſome being intended for motion, others for reſt, and the ſupport of the incumbent parts only. The articulation intended for manifeſt motion is called *diarthroſis*; for obſcure motion, *ſynchondroſis*; and that without motion, *ſynarthroſis*.

ENARTHROSIS is where a round head is received into a round cavity, which

which Mechanicks call the *ball* and *ſocket*; though none of the articulations in a human Body fully reſemble that, but the upper-end of the thigh-bone with the *Os innominatum*.

GINGLYMUS is deſcribed to be where a *Bone* receives and is received, which is right, when joined like hinges, as the oblique proceſſes of the *vertebræ* of the loins, where authors take two joints to make a *ginglymus*, that it may anſwer their deſcription, though any one of theſe joints is a true *ginglymus*. But in the other *vertebræ*, and in the articulation of the *ulna* with the *Os humeri*, and that of the *radius* with the *ulna*, there being only the motion of the hinges, without the form to give theſe joints this denomination, we may for the ſame reaſon call every joint a *ginglymus*, whoſe property is only to bend and extend, as the *knee*, *ancle*, &c. and what makes it more neceſſary to bring theſe joints under this head, is, that they are reducible to no other.

SYN-

SYNCHONDROSIS is by intervening cartilages or ligaments, as between the bodies of the *vertebræ*; but the trueſt *ſynchondroſis* is the joining of the ribs to the *ſternum*.

SYNARTHROSIS is of two kinds, *viz. ſutura* and *gomphoſis*. The firſt is the mutual indention of one *Bone* with another, as in the skull; and the other, the faſtning of the teeth in their ſockets, like a nail in wood.

SECT. II.

Of the CARTILAGES *and* LIGAMENTS.

A CARTILAGE *is a ſmooth, ſolid, uniform, elaſtic ſubſtance, ſofter than a Bone, but harder than any other part.*

CAR-

CARTILAGES ſeem to be nearly of the ſame nature with *Bones*, and only to differ as more or leſs hard. There are ſome very hard, and which become bony with time; as thoſe, *e. g.* which unite the ribs with the *ſternum*, Others are ſofter, and ſerve to conſtitute the *aſpera arteria*, the *larynx*, the *bronchia*, the *noſtrils*, the *ears*, the *brims* of the *eye-lids* and other parts, where an eaſy gentle motion is required; their natural elaſticity ſerving them inſtead of antagoniſt muſcles. There are others ſofter ſtill, partaking of the nature of ligaments, and are thence called *ligamentous cartilages*.

CARTILAGES are of various figures, acquiring various names from the things they reſemble: one is called *annularis*, becauſe it reſembles a ring; another *xyphoides*, from its reſembling the point of a dagger; a third *ſcutiformis*, becauſe made like a buckler; and ſo of the reſt.

CAR-

CARTILAGES have no cavities for marrow. Their uſes are to prevent the *Bones* from being damaged or wounded by a continual friction; to join them together by a *ſynchondroſis*, and to contribute in great meaſure, to the well forming of ſeveral parts; as the *noſe*, *ears*, *trachea*, *eye-lids*, &c.

A LIGAMENT *is a white, cloſe, and compact ſubſtance, incloſing, defending, and keeping together the parts of the Body.*

IT has no conſpicuous cavities, and is very different according to the different parts where it is found. It is harder than a membrane, yet ſofter than a cartilage; its principal uſe is to gird, fix, and ſtrengthen the joints, and to ſecure the *Bones* in their different motions from parting from each other, as it happens in luxations.

SECT.

SECT. III.

Of the BONES *of the* HEAD.

THE *Head* is divided into the *Cranium* or *Skull*, and *Jaw-bones*.

CRANIUM * is that part of the head which forms the great bony cavity containing the brains: and therefore all the *Bones* that unite to make up this cavity, are, by Anatomiſts, called the *Bones of the skull*.

THE figure of the *cranium* is globular, or, rather oval, and ſomewhat long, it bunches out a little before and behind, and is more flat on the ſides, for the better ſituation of the temporal muſcles

* Calva, calvaria, cerebri galea, theca, & olla capitis, teſta capitis, ſcutella capitis.

muſcles, which being on, make it look more round.

Plate I. Fig. 2. THE *Cranium* conſiſts of *two tables*, between which there is a thin and ſpongy ſubſtance, made of ſome bony fibres that come from each table, called *diploe* or *meditullium*, *a*, *a*, *a*, *&c.*

THE *Bones of the skull*, are eight *viz*, the *Os frontis* the two *Oſſa parietalia*; the *Os occipitis*; the two *Oſſa temporum*; the *Os ſphenoides*, and the *Os ethmoides*.

Fig. 1. *OS FRONTIS*, * A, the *Forehead-bone*, is ſituate in the fore-part of the skull, and forms the upper part of the face, and of the orbits, and a part of the temples.

ITS figure is ſymmetrical, reſembling a large ſhell almoſt round; ſo that two frontal *Bones* of the ſame ſize joined together, nearly repreſent one ſort of ſhell-fiſh. IT

* Coronale, Inverecundum, puppis, ſenſus communis, quibuſdam ſincipitis.

IT is connected above, *a*, with the *Ossa parietalia*, below, *b*, with several *Bones* of the upper-jaw, and in the sides with the *Ossa temporum*, C. In its internal surface is impressed the external figure of the two hemispheres, *b*, of the brain; there is also in its middle a *thin spine*, to which the *sinus longitudinalis* of the *dura mater* adheres.

THIS *Bone* has two or three large sinus's, *c*, above the eye-brows between its two tables; they are lined with a membrane full of glands, which separate a mucous serosity to moisten the nose. Fig. 2.

OS OCCIPITIS, *A, the *Occipital Bone* is situate in the hind and lower part of the *cranium*, or skull, and represents a kind of lozenge irregularly indented, and yet symmetrical, convex on the out, and concave on the inside. Plate II. Fig. 1.

* Basilare, proræ, memoriæ, pixidis.

IT is joined on the upper part to the *Ossa parietalia*, or *sincipitis*; on the lower and lateral parts, to the *Ossa temporum*, *a*, or temporal *Bones*; on the lower and fore-part to the *Os sphenoides*,
Fig. 2. *d*, both which in adults make commonly but one *Bone*.

THE *Os Occipitis* forms the back-part of the head, serves for the articulation of the head with the trunk, by means
Fig. 1. of its *processus condyloides*, *g*, contains a part of the brain, and almost all the *cerebellum*; gives passage to the *medulla oblongata*, through the *foramen ovale ossis occipitis*, and to a great many vessels and nerves; and gives insertion to a great many muscles.

Plate I. Fig. 1. *OSSA PARIETALIA*, * B, the *parietal Bones* are two, one on each side, situate on the superior, lateral, and a little on the hind-parts of the skull. Their extent is larger than any other bone

* Paria, sincipitis, verticis, arcuatia, nervalia, cogitationis, rationis, bregmatis, madefactionis.

bone of the skull, and their figure reſembles that of a convex ſquare. They are joined and connected before with the *Bone* of the forehead, *a*, *a*, behind with the *Os occipitis*, on each ſide to the *Oſſa temporum*, *c*, and to one another in the middle of the crown, *d*. Theſe *Bones* contain a large ſhare of the brain, form a part of the temples, and ſerve for the inſertion of the temporal muſcles.

OSSA TEMPORUM, * C, the *Bones of the ſkull*, are two, ſituate in the lower and lateral parts of the ſkull. The figure of each is partly ſemicircular, like the ſcale of a fiſh, partly like a ſhapeleſs rock ending in ſeveral points. Each *Os temporis* is joined above to the *Os frontis* and *parietale*, behind and below to the occipital *Bone*, before to the great *alæ* of the *Os ſphenoides*, *e*, and below to the ſpinal apophyſes of that

Plate I. Fig. 1.

Fig. 2.

* Temporalia, lapidoſa, mendoſa, dura, arcualia, armalia.

that *Bone*. It is alſo joined before to the
Fig. 1. *Os malæ*, *e*, or cheek-bone.

Plate I. and II. Fig. 1, 2. THEY have each four proceſſes, *viz.* The firſt is the *proceſſus jugalis* or *zygomaticus*, *f*, *e*. It proceeds from the middle and lower part of each of theſe *Bones*, and unites with the proceſs of the *Os malæ*. The ſecond is the *mamillaris*
Plate II. Fig. 1. or *maſtoidæus*, *l*. It is thick, ſhort, and a little hollow within, placed at the bottom of the auditory paſſage. The third is the *ſtyloidis* or *ſtyliformis*, *c*, which is long, ſmall and ſharp: To it the horns of the *Os hyoides* are faſtened.*
Plate I. Fig. 2. The fourth is the *petroſus*, *t*, which is pretty long and big in the baſis of the skull: It is hollow, and contains the inſtruments of hearing, in particular the four little *Bones* of the ear, *viz.* the *incus*, *malleus*, *ſtapes* and *Os orbiculare*.

(1) *INCUS*

* THOSE animals which want the *proceſſus ſtyloidis*, their *Os hyoides* have a double horn or proceſs which ſupplies its place.

(1) *INCUS*, A, D, the *Anvil*, is ſituate under the *Bone* called *malleus*, A, and reſembles, in ſome meaſure, one of the fore-grinders, with its roots at a great diſtance from each other. The ſhorter root is tied to the ſide of that conduit which goes to the *proceſſus mamillaris*, and the longer to the third *Bone* called *ſtapes*. Plate II. Fig. 7. Fig. 4.

(2) *MALLEUS*, C, *the Hammer*, is a long *Bone*, with a large head, a ſmall neck, a handle, and two apophyſes or protuberances, one in the neck, the other in the handle. The head and neck are turned upward and inward, the handle downward parallel to the long leg of the *incus*, but more forward; the apophyſis of the handle upward and outward, near the higher part of the edge of the *tympanum*, near the center of which is the extremity of the handle; and the *apophyſis gracilis*, or that of the neck forward, reaching to the articular fiſſure in the *Os temporis*. After what has been here hinted at, the *malleus* of the right ſide may be eaſily diſtinguiſhed from that of the left. Fig. 6.

Fig. 5. (3) *STAPES*, B, the *ſtirrup*, is divided into the head, legs and baſis. The head is placed on a ſhort flatted neck, the top is ſometimes flat, ſometimes a little hollow; the two legs form an arch like that of a ſtirrup, and the baſis reſembles that of a ſtirrup, both in its oval ſhape and union with the legs. When the ſubject is in an erect poſture, the *ſtapes* is to be ſuppoſed lying on its ſide, with the head turned outward, near the extremity of the leg of the
Fig. 4. *incus*, *a*, the baſis inward being fixed in the *feneſtra ovalis*, or the opening in the barrel of the ear, the longeſt leg backward, the ſhorteſt forward, and both in the ſame plane. By this ſituation we may know the *ſtapes* belonging to each ear.

(4) *OS ORBICULARE*, the *orbicular* or *lenticular Bone*, is the ſmalleſt *Bone* in the body. It lies between the head of the *ſtapes*, and the
Fig. 4. extremity of the long leg of the *incus*, *b*. In dry *Bones* it is ſometimes cloſely con-

connected to the *ſtapes*, ſometimes to the *incus*, and might eaſily be taken for an epiphyſis, or growing to either of theſe *Bones*.

THE chief uſes of theſe *Bones* are to compleat the globe of the ſkull, to ſerve for the articulation of the lower-jaw, for the inſertion of many muſcles, and to contain the organ of hearing.

OS ETHMOIDES, * A, the *ethmoidal* or *ſieve-like Bone*, is ſituate more inwardly in the fore-part of the *baſis cranii*, and is of a cubical form. It is joined to the *Os frontis*, *Os ſphenoides*, *Offa naſi*, *Offa maxillaria*, *Offa unguis*, *Offa palati* and *vomer*. This *Bone* is perforated by a number of ſmall holes, through which the olfactory nerves paſs. Plate I. Fig. 2.

THE uſes of it are a chief part of the organ of ſmell, and give a great extent to the pituitary membrane in a ſmall compaſs.

OS

* Cribriforme, ſpongiforme.

Plate I. Fig. 2. *OS SPHENOIDES*, * B, the *ſphenoidal* or *wedge-form Bone*, is ſituate in the lower-part of the skull, a little toward the fore-part, making the middle of the baſis of the skull, whence it has got the name of *Os baſilare*. Its form is irregular, and not eaſy to be deſcribed, yet it may be ſaid to repreſent a Bat with its wings ſpread. It is joined to all the other *Bones* of the *cranium* by the ſphenoidal ſuture. In adults 'tis one continued *Bone*; but in children ſometimes conſiſts of three, and ſometimes of four diſtinct pieces.

Plate I. Fig. 1. ALL theſe Bones of the skull are joined together by four ſutures. The firſt is the *coronalis*, *a*, which runs acroſs the skull from one temple to the other, joining the *Os frontis* to the *Oſſa parietalia*. The ſecond is the *ſagittalis*, *d*, which joins the *parietal Bones*; it begins at the *Os occipitis*, and is continued to the *Os*

* Cuneforme, paxillum, cribratum, palati, colatorii, cavilla, baſilare.

Os frontis, and in children for ſome years to the top of the noſe, dividing the *Bone* of the forehead into two, which ſometimes happens in grown perſons. The third is the *lamdoides*, *d*, ſo called, becauſe it reſembles the *Greek* letter Λ; it joins the *Bone* of the *occiput* to the *Oſſa parietalia*, and *temporum*: between the ſutures are found little *Bones* called *triquetra*. The fourth is called *ſutura ſquammoſa*, *c*, becauſe the parts of theſe *Bones* which are joined by this ſuture, ſuch as the *Oſſa temporum*, the *Os ſphenoides*, are, as it were cut aſlope, and tapped over one another like ſcales. Plate II. Fig. 1. Plate I. Fig. 1.

THE *Jaw-bones* are compoſed of the other *Bones* of the head that no way contribute to the formation of its cavity: one of theſe is called the *upper-jaw*, and the other the *lower*.

THE *Upper-jaw* is compoſed of thirteen *Bones* and ſixteen teeth, if their number be compleat: of theſe thir-

thirteen *Bones* there are ſix pair and one ſingle.

First Pair. Plate I. *and* II. Fig. 1. *OSSA MAXILLARIA*, D, are two, ſituate in the middle part of the face. They are of a large extent, but of a very irregular figure. The *maxillary* Bones are connected with the *Os frontis*, *Os ethmoides*, *Os ſphenoides*, *Oſſa unguis*, *Oſſa malarum*, *Oſſa naſi*, *Oſſa palati*, *vomer*, *conchæ narium inferiores*, and with each other. They aſſiſt in forming the organ of maſtication, the arch of the palate, the cheeks, and the orbits of the noſe.

Second Pair. Plate I. Fig. 1. *OSSA MALARUM*,* E, are two, ſituate in the ſide and middle parts of the face, and are almoſt triangular, or irregularly ſquare. The *Os malæ* on each ſide is joined to the *Os frontis*, by the angular apophyſis, to the *Os ſphenoides* by the lower apophyſis, to the *Os temporis* by the zygomatic apophyſis, and to the *Os maxillare* by its baſis. Theſe *Bones* make

* Jugalia vel zygomatica.

make the prominent upper-part of the cheeks, moſt remarkable in lean perſons. They alſo form a part of the orbit, and compleat the zygomatic arches.

OSSA NASI, F, *the Bones of the noſe* ſituate below the forehead between the two naſal apophyſes of the *Oſſa maxillaria*. Each of theſe *Bones* comes near the figure of an oblong ſquare, the upper extremity being narrow and thick, the lower oblique and thin, the middle part bent inward near the upper-end in ſome ſubjects, in others almoſt ſtraight. Theſe two *Bones* joined repreſent a ſaddle. They are above joined to the naſal apophyſis of the *Os frontis*, laterally to the naſal apophyſis of the *Oſſa maxillaria*, and internally to the fore-edge of the perpendicular *lamina* or plate of the *Os ethmoides* by a prominent line. They form the fore and upper-part of the noſe, and a part of the *ſeptum narium*, or that part which ſeparates the noſtrils from each other. *Third Pair.* Plate I. Fig. 1.

OSSA

Fourth Plair. Plate I. Fig. 1.

OSSA UNGUIS, G, or *lachrymalia*, whereof there are two, each is ſituate in the great corner of the orbit of the eye at the lower part of the internal angle. They are the leaſt *Bones* of the face, and are very thin and tranſparent. They are longer than broad, reſembling almoſt the nail of a finger, from whence they have this name, when they are in their true ſituation, but if taken out of the ſkull their figure is more irregular. They are connected with the *Os frontis*; the *Os ethmoides* covering a part of the cells in that *Bone*, the naſal apophyſis of the *Os maxillare*, and with the groove of that *Bone*, in ſuch a manner as that the two grooves joined together form an intire tube, called the lachrymal duct. They alſo cover a little the opening of the maxillary ſinus's or cavities, and join the lower *conchæ* of the *nares*, whereof they ſeem only to be a continuation in an advanced age. They compleat the internal ſides of the orbit, cover the fore-part of the labyrinth of the noſe, and form the lachrymal duct.

OSSA

OSSA PALATI, B, the *Bones* of the palate are two, ſituate in the hind-part of the arch of the palate between the pterygoide apophyſes, or wing-like proceſſes of the ſphenoides, and the *Oſſa maxillaria*, and running up on the ſides of the naſal *foſſæ* all the way to the bottom of each orbit. The intire *Bone* is crooked, hooked, pointed and uneven, though but of a ſmall ſize. They are joined to each other by the *portio palatina*, to the *vomer* by the common groove formed by their raiſed edges, to the maxillary *Bones* before, and laterally to the ſphenoidal *Bone* behind, to the lower ſhells of the *nares* by their tranſverſe eminences; and laſtly by their round parts to the *Os ethmoides*, *Oſſa maxillaria*, and *Os ſphenoides*. They compleat the arch of the palate, the pterygoide and naſal *foſſæ*, and the orbit; they aſſiſt in ſupporting the *vomer* and *conchæ nariuin inferiores*. Fifth Pair. Plate II. Fig. 1.

OSSA TURBINATA, or *ſpongioſa inferiora*, are two ſituate in the naſal *foſſa* below Sixt Pair.

below the openings of the maxillary *ſinus*, and above the lower orifices of the lachrymal duct, and their figure is much like that of the upper ſhells: they are joined to the *Oſſa maxillaria*, *Oſſa palati*, *Oſſa unguis*, and ſometimes to the *Os ethmoides*. In moſt skeletons theſe connexions are but ſlender, and therefore theſe *Bones* are eaſily loſt, which is the reaſon why the ancients have not obſerved them. They compleat the long ſtructure of the noſe, augment its ſurface, and render it proportionable to the extent of the organ of the ſmell, and of the pituitary membrane.

Plate II. and I. Fig. 1.

THE laſt or thirteenth *Bone* of the jaw, which is ſingle, called *VOMER*, C, H, is perpendicular between the two naſal *foſſæ* backward. Its figure is nearly that of an oblique ſquare, having ſome reſemblance to a plough-ſhare, from whence it has its name. It is joined to the *Os ſphenoides*, *Os ethmoides*, *Oſſa maxillaria* and *Oſſa palati*; and forms the hind-part of the *ſeptum narium*.

MA-

PLATE I. *Pag. 30*

FIG. I

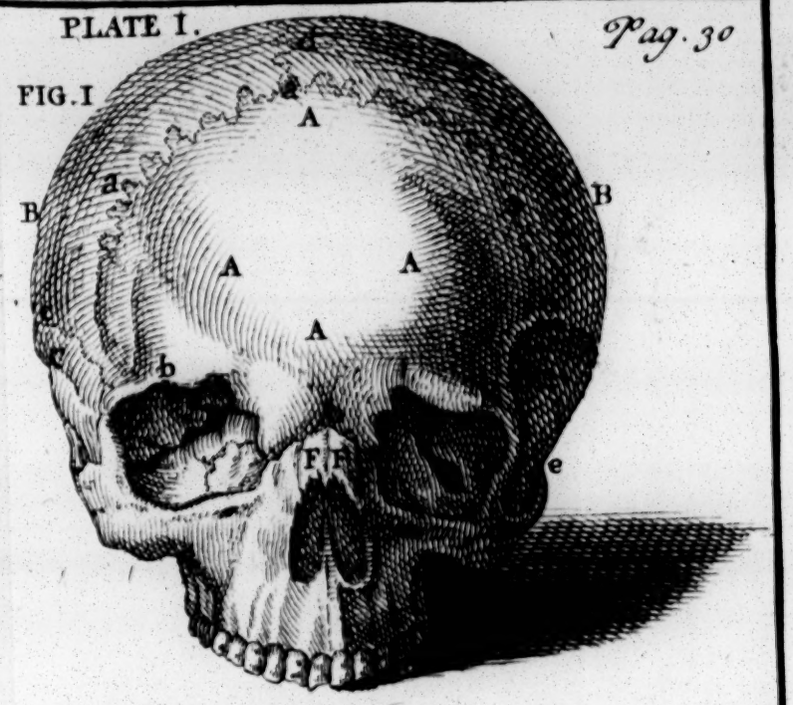
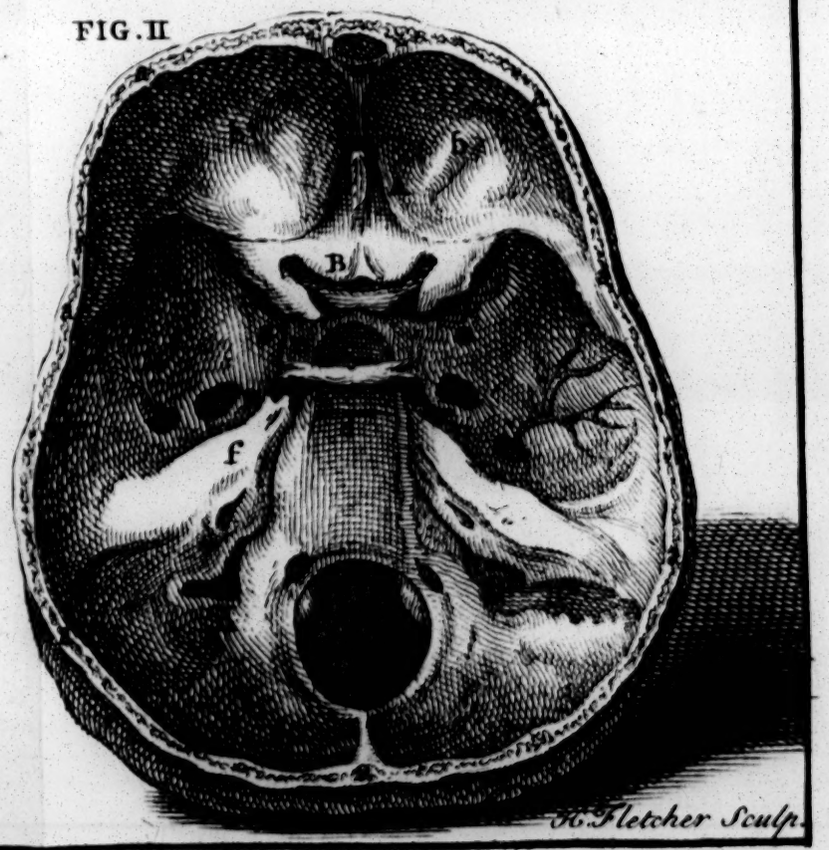


FIG. II



MAXILLA INFERIOR, C, the *lower jaw*, is but one *Bone* in adults, two in children, it makes the lower part of the face, and reſembles a bow with the ends bent upward. The lower-jaw is joined to the *Oſſa temporum* by a ſingle kind of articulation, ſharing of the nature both of a *ginglymus*, or articulation of a *Bone*, when it both receives and is received; and *arthrodia*, or the articulation of one *Bone* into the ſhallow ſinus of another. Plate II. Fig. 2. *and* 3.

AT each end of the lower-jaw are placed two proceſſes, whereof one is called *condyloides*, *a*, which has a long neck and a round head covered with a moveable cartilage: by this head the jaw is articulated into a ſinus of the *Os temporis*, lined with a cartilage, and faſtned ſtrongly thereto by a membranous ligament. The other proceſs called *coronalis* or *corone*, *b*, which ariſes near the former, is very acute, paſſes under the *proceſſus zygomaticus*, and has the tendon of the crotaphite muſcle firmly inſerted into it.

BOTH

BOTH *maxillæ* or *jaws* are furniſhed with 32 teeth, 16 in each, called *inciſores*, *canini* and *molares*; the firſt are eight in number, the ſecond four, and the third twenty.

Plate II. Fig. 3. *DENTES INCISORES*, 1, 2, 3, 4, *&c.* are eight, ſituate in the fore-ſide, and in the middle of the others, and are inſerted into their *alveoli*. The four upper *inciſores* are larger and broader than the four lower; and of the upper, the two in the middle are larger than the other two. The bodies of theſe teeth reſemble ſharp cutting wedges, and their roots pointed wedges. The bodies are ſo diſpoſed, that their ſharp edges lie all in a line making one uniform edge. They have a long and crooked root, and divided into two, by which they have the greater force in cutting the aliments, which is their proper uſe.

Plate II. Fig. 3. *DENTES CANINI*, *a*, the *dog-teeth*, are four, two in each jaw, one on

on each ſide of the *inciſores*. They are thick and round, and end in a ſharp or triangular point, they have each one root, which is longer than the roots of the *inciſores*, and their uſe is to pierce the harder kinds of meat.

DENTES MOLARES, *d*, the *grinders*, ſo called, becauſe they ſerve as ſo many mills to grind the food. They are generally twenty in number, five placed on each ſide of both jaws, immediately after the *canini*. The two firſt in each row are ſmall, the two next larger; as is alſo the laſt, which comes very late, and is often wanting. Their bodies in general are ſhort, thick, irregularly cylindrical, or rather with four ſides a little rounded, and terminated by a broad end more or leſs filled with obtuſe points, cut almoſt like ſo many diamonds. The *teeth* are connected with the ſockets in both jaws by an articulation without motion, called *gomphoſis*. They are fixed in the ſockets like pins or nails, their roots being ſurrounded by the Plate II. Fig. 3.

ſpongy ſubſtance, and appearing like moulds for the cavities of the ſockets, which are rather porous *vaginæ*, than ſpongy *foſſulæ*. The trunk of the root is ſurrounded by the common orifice of the ſocket at a ſmall diſtance from the circular line or collar.

THE *Teeth* in general ſerve for maſtiration or chewing. In particular, the *inciſores* tear and cut the food, the *canini* break it into pieces, and the *molares* bruiſe and grind it. The *teeth*, eſpecially the *inciſores*, alſo aſſiſt the articulation of ſounds.

WE ſhould now have proceeded to deſcribe the *Bones* of the cheſt or trunk, but we muſt firſt conſider a *Bone* which cannot properly be ſaid to belong either to head or trunk; nor is immediately joined with any other, and therefore is rarely preſerved with the ſkeleton; however, it is generally deſcribed by authors, after the *Bones* of the face, and according to the prevailing method we ſhall next treat of the OS

OS HYOIDES, * the bone of the *Tongue*, is ſituate in the middle ſpace between the angles of the lower jaw. It is a little *Bone*, and almoſt reſembles the baſis of the lower jaw, or a ſmall bow †. It is connected by a ligamentary *ſymphiſis*, or joint, with the *ſtyloide* apophyſes, the *cartilago thyroides* of the *trachea arteria*, and the *epyglottis*. Plate III. Fig. 2. and 3.

THE chief uſe of the *Os hyoides*, is to ſerve as a ſolid lever for the muſcles to act with in raiſing or depreſſing the tongue and *larynx*, or in enlarging and diminiſhing the capacity of the fauces.

* *Hypſyloides*, *Lambdoides*, *Os gutturis*, *Os linguæ*, *Os morſus Adami*, *aſſeſſor*.

† A is that point of the *Os hyoides*, called its baſis Fig. 2. A, Fig. 3. ſhews the internal concave part of its baſis, B, the horns of the *Os hyoides*, C, the cartilaginous appendages.

SECT. IV.

Of the BONES *of the* TRUNK.

HAVING finiſhed the *Bones of the Head*, we ſhall next treat of the *Bones of the Trunk*, and firſt of the *vertebræ*, * A, A, a chain of little bones reaching from the top of the neck down the back to the *Os ſacrum* B, and forming a third part of the human skeleton, called the *ſpina dorſi*. The *vertebræ* have their name *a vertendo*, becauſe it is on them the head and trunk turn.

Plate III, IV *and* V. Fig. 1.

THE *vertebræ* are twenty four in number; ſeven of them belong to the neck,

* Spondyli, oſſa orbiculata; oſſa vertebrata.

PLATE II. *Pag. 36.*

FIG. I.

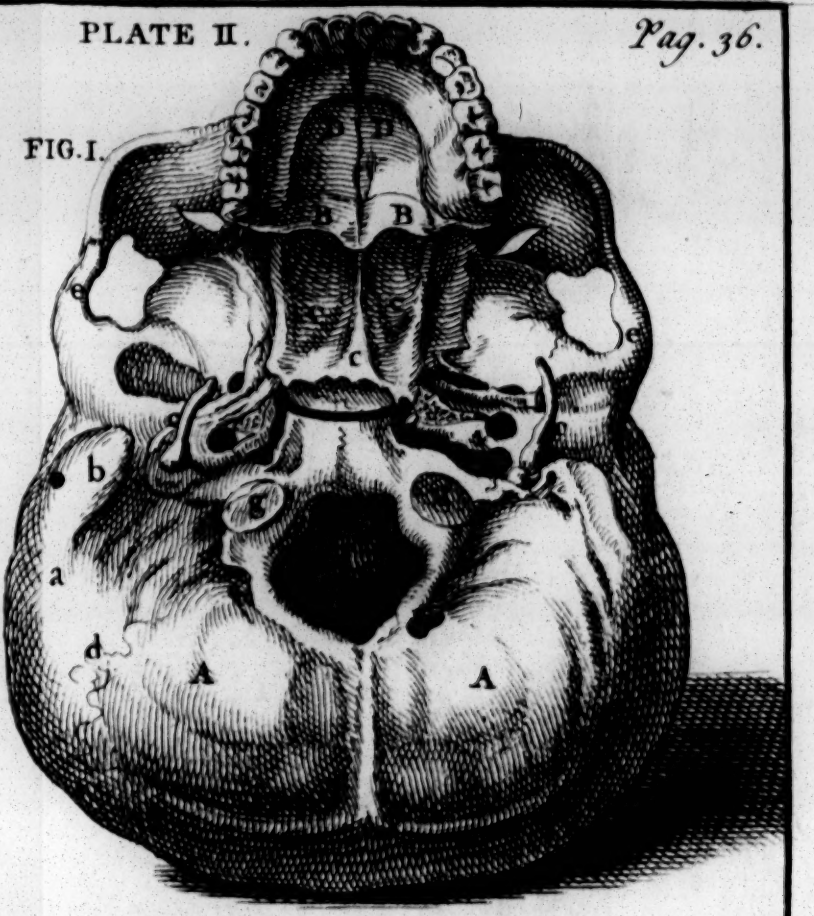


FIG. III.

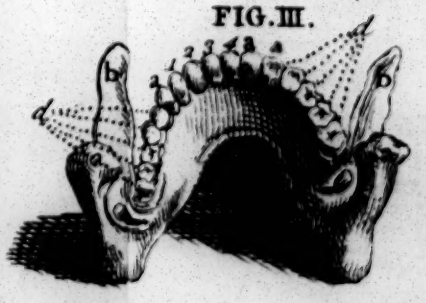


FIG. II.



FIG. IV.



FIG. V.



FIG. VI.



FIG. VII.



H. Fletcher Sculp.

neck, twelve to the back, and five to the loins, to which are likewiſe given the names of *cervical*, *dorſal*, and *lumbar vertebræ*. *

THEY lie not in a ſtrait line; thoſe of the neck bend inward; and thoſe of the back outward, for enlarging the cavity of the *thorax*; and thoſe again of the loins, bend inward, and thoſe of the *Os ſacrum* outward to enlarge the cavity of the baſon.

THE *vertebræ* are compoſed of a body and ſeven apophyſes, the body of each *vertebra* is ſpongy and cavernous.

THE fore-part of this body is round and convex, the hind-part ſomewhat concave: its upper and lower edges are plain; each covered with a cartilage, which is pretty thick forward, but thin backward, by means whereof it is that we bend the body forward, the

* See theſe marked with figures in Plate IV.

the cartilages yielding to the preſſure of the bodies of the *vertebræ*, which, in that motion, come cloſer to one another: which could not be effected, if the harder bodies of the *vertebræ* were cloſe to one another.

THE proceſſes or apophyſes of each *vertebra* are of three ſorts: two tranſverſe or lateral; in each of which there is a tendon of the vertebral muſcles inſerted: four oblique ones, by which the *vertebræ* are articulated to one another; and one acute on the hind-part of the *vertebra* *.

THESE proceſſes, peculiarly called ſpinal, form, with the reſt, a large cavity, and all the holes anſwering to each other make

* Plate III. Fig. 1. *a*, *a*, the proceſſes, or prominences, of the atlantic *vertebræ*. *b*, The proceſſes of *ſcapula* called *acromia*. Plate IV. Fig. 1. G, the proceſs called the ſpine of the *ſcapula*, *a*, *a*, the direct apophyſes of the *vertebræ*, *b*, *b*, tranſverſe or lateral apophyſes of the *vertebræ*. Plate V. Fig. 1. A, A, Apophyſes or *proceſſus recti* of the *vertebræ* of the neck and loins.

make a channel for the deſcent of the ſpinal marrow, which ſends out its nerves to the ſeveral parts of the body by pairs, thro' two ſmall holes formed by the jointing of four notches in the ſides of each ſuperior and inferior *vertebra*.

THE articulations of the *vertebræ* are compound; their bodies are joined to one another by *ſynchondroſes* or cartilages, which, in this articulation, are ſofter and more ſpongy than in any other; the articulation of their proceſſes reſemble almoſt a *ginglymus*, for the two deſcending oblique proceſſes, of each ſuperior *vertebræ* of the neck and back, have, in their extremities, a little dimple, wherein they receive the extremities of the two aſcending oblique proceſſes of the inferior *vertebræ*; ſo that the two aſcending proceſſes of each *vertebra* of the neck and back are received, and the two deſcending of the neck and back do receive, except the firſt of the neck, and laſt of the back; but

but the aſcending proceſſes of each *vertebra* of the loins receive, and the two deſcending are received, contrary to thoſe of the neck and back.

THE *vertebræ* are all tied together by a hard membrane made of ſtrong and large fibres; it covers the body of all the *vertebræ* forward, reaching from the firſt of the neck to the *Os ſacrum*. There is another membrane, that lines the canal, made by the large hole of each *vertebra*; which ties them together: likewiſe, the tendons of the muſcles, inſerted in their proceſſes, tie them together behind.

THIS ſtructure of the ſpine is admirable; for, had it not been all one bone, we could have had no motion in our backs; had it been of two or three bones articulated for motion, the *medulla ſpinalis* muſt have been neceſſarily bruiſed at every angle or joint; beſides, the whole would not have been ſo pliable for the ſeveral poſtures we have

have occaſion to put ourſelves in: if it had been made of ſeveral bones, without intervening cartilages, we ſhould have had no more uſe of it than if it had been but one bone. Laſtly, the oblique proceſſes of each ſuperior and inferior *vertebra* keep the middle one, that it can neither be thruſt backward nor forward, ſo as to compreſs the *medulla ſpinalis*.

THE *vertebræ* of the neck differ from the reſt, in that they are ſmaller and harder, their tranſverſe proceſſes perforated for the paſſage of the vertebral veſſels, and their acute proceſſes forked and ſtraight: the firſt and ſecond are intirely peculiar. The firſt called *Atlas*, * B, is articulated to the the head, and gives it a nodding motion; this *vertebra* moves upon the ſecond in a ſemicircular motion, giving room to the head to turn itſelf from ſide to ſide. Plate III *and* IV. fig. 1, 2.

THE

* *a*, *a*, Are the two ſinus's which receive the *occiput*; *b*, *b*, the tranſverſe proceſſes, in which are *foramina*, thro' which blood-veſſels paſs to the head.

Fig. 3. THE ſecond Z, * is called *epiſtrophæus*, or *vertebra dentata*: its body is narrower and longer than the following *vertebræ*, and its length is increaſed on the upper-part by an eminence like a pivot or *axis*, which is received into a ſinus of the *atlas*; and upon it the head with the firſt *vertebra* turns half round as upon an axis. The extremity of this proceſs is knit to the *occiput* by a ſmall, but ſtrong ligament.

THE third *vertebra* is called *axis*, and differs not much from the *vertebræ* of the neck already deſcribed; the upper apophyſes anſwer to the lower apophyſes of the ſecond *vertebra*.

THE fourth, fifth, and ſixth *vertebræ* are like the third, except that their bodies are gradually more extended, but ſtill hollow on the upper-ſide and convex on the lower; and that the ſpinal apophyſis of the ſixth *vertebra* is longer, thinner, and ſtraighter than in

* *a*, Its proceſs called *dens*, *b* its double ſpine.

in the three above it. The lower apophyſes of the fourth, and fifth *vertebræ*, and the upper of the ſixth are not ſo much inclined as thoſe above them.

FROM the fourth *vertebra* to the laſt, the ſize of the bodies gradually increaſe, but more between the upper and lower, than the fore and back-ſides. Therefore when the whole pillar of the dorſal *vertebræ* is viewed on the fore-ſide, a ſenſible contraction is perceptible in the upper half of the pillar, which appears not in a lateral view.

THE *Vertebræ* of the back have four ſmall cartilaginous impreſſions, two on each ſide of their bodies, one at the upper edge, the other at the lower near the apophyſes. Theſe impreſſions are obliquely hollow, and ſo diſpoſed as that the inferior in the body of one *vertebra*, and the ſuperior in the next below, form a kind of niche wherein the

the heads or ends of the ribs are articulated. In the firſt *vertebra* there is commonly an intire niche for the firſt rib and half of another for the ſecond: the two laſt *vertebræ* have generally but one intire niche on each ſide. Theſe marks are peculiar to the *vertebræ* of the back, and eaſily diſtinguiſh them from the reſt.

THO' each *vertebra* has but a ſmall motion, yet the motion of them all is conſiderable: the head, as we have obſerved, moves only backward on the firſt *vertebra*, and ſemicircularly on the ſecond. The motion of the other *vertebrae* of the neck is not ſo manifeſt, yet it is greater than that of the *vertebræ* of the back; becauſe their acute proceſſes are ſhort and ſtraight, and the cartilages between their bodies thicker. The *vertebræ* of the back have the leaſt motion of any; becauſe their cartilages are thin, their acuteſt proceſſes long, and near each other: and they are fixed to the ribs.

The

The greateſt motion of the back is performed by the *vertebræ* of the loins, becauſe their cartilages are thicker, and their acute proceſſes at a greater diſtance from each other; for the thicker the cartilages are, the more we can bend the body forward, and the greater diſtance there is between the acute proceſſes, the more we may bend backward.

SUCH is the ſtructure and motion of the *vertebræ*, when in their natural poſition; but we often find them variouſly diſtorted. If the *vertebrae* of the back ſtick out, it makes what we call *bunched back* A; and in ſuch caſes the cartilages between the *vertebrae* are very thin and hard forward, but conſiderably thick backward, where the oblique proceſſes of the ſuperior and inferior *vertebræ* are at a conſiderable diſtance from each other, which diſtance is filled up with a viſcous ſubſtance. Plate V. Fig. 2.

OS

Plate IV. Fig. 1. *OS SACRUM*, * B, B, ſituate in the hind and lower part of the trunk, as the baſis by which the whole ſpine is ſupported; and from hence it has been by ſome termed *Os baſilare*. Its figure comes near that of a long triangle with the baſis upward, and the *apex* downward. In children it is made up of ſeveral pieces termed falſe *vertebrae*, united by cartilages, which in time diminiſh, grow hard, and diſappear; leaving no marks behind them, but little ridges more or leſs prominent. Theſe pieces are five in number, and ſometimes ſix; all of them in ſome thing reſembling the *vertebrae*. The firſt is larger than any of the true *vertebrae*, but their ſize diminiſhes in proportion as they deſcend, ſo that the loweſt which makes the point of the *Os ſacrum* has ſcarce the appearance of a *vertebra*. It has three different articulations; the firſt is with the laſt of the *vertebrae*; the ſecond with the *Os coccigis*

* *Latum* πλατὺ καὶ μεγάλης *Hippocrat.* ὑπερπλατὺ *Oribas.*

cigis by *ſynchondroſis*, and the third with the bones of the hips *

THE uſe of the *Os ſacrum* is to ſuſtain the ſpine with all that belongs to it, but to do this it ſhould be ſtrongly connected with, and incloſed by the *Oſſa innominata*, with which it forms the *pelvis*. Its lower extremity is turned far backward, and thereby the lower part of the *pelvis* is enlarged.

OS COCCYGIS † C, joined to the extremity of the *Os ſacrum*, and is, in ſome meaſure, an appendix thereof. Its figure is almoſt like an inverted pyramid, or a Cuckoo's bill; whence the name. The fore-ſide is flat, the hind a little convex. It is made up of three or four bones, of which the lower is ſtill leſs than the upper, till the laſt end in a ſmall cartilage. Its uſe is to ſuſtain the *Inteſtinum rectum:* it yields Plate IV. Fig. 1.

to

* See O, O, in Plate III. Fig. 1. the inner face, and G in plate V. Fig. 1. the ſide-view of the *Os ſacrum*.

† *Caudæ os, ſpondylium.*

to the preſſure of the *fœtus* in women in travail; and midwives uſe to thruſt it backward; but ſometimes rudely and violently, which is the occaſion of great pain, and ſeveral bad effects.

Plate III. Fig. 1. *The uſe and mechaniſm of the ſpine.*

THE Spine * A, A, taken together is the ſupport of all the other bones, and the univerſal director of all the attitudes neceſſary for their different motions: to give a machine both theſe advantages, it muſt have two properties, ſtrength and pliableneſs, and it will be ſtill more perfect, if it be light in proportion to its bulk.

THE wiſe author of nature has framed the ſpine, with theſe advantages in a manner which is more wonderful, becauſe moſt ſimple. He has made the ſpine flexible by the number of pieces of which it is compoſed; he has made it firm and ſtrong, by diſpoſing theſe pieces, ſo as naturally to ſupport and

which

* *Rachis.*

ſuſtain each other, and by framing them in the moſt convenient manner for that infinite number of chords, by which they are tied together; and laſtly, their internal ſtructure renders them very light.

THE contrivance of this excellent machine is not the ſame in all the three claſſes of the *vertebræ*. Thoſe of the back and loins eaſily ſuſtain each other, and by the extent and direction of their bodies; and in all of them, this diſpoſition is proportioned to the weight they bear, the inferior *vertebræ* being larger than thoſe above them.

THE contraction of this bony pillar at the fourth or fifth *vertebra* of the back does not in the leaſt impair this mechaniſm; for it being at that place in a particular manner ſtrengthened by the connexion of the true ribs, large *vertebræ* would there have been uſeleſs; whereas, by diminiſhing their ſize, the

capacity of the *thorax* is increaſed, for the more commodious reception of the *viſcera*.

IN the *vertebræ* of the neck the caſe is different, their bodies are but ſmall and their ſides narrow; the ſituation of the whole row of theſe *vertebræ* is oblique, and inclined forward, except the two firſt, which are placed perpendicularly. To be able to judge how far this obliquity extends in a living body, we may either ſit or ſtand, holding our head in a ſtraight poſture, and then obſerve the ſituation of the maſtoide apophyſis, becauſe the articulation of the firſt *vertebra* of the neck with the condyles of the *Os occipitis* is exactly between the fore-edges of theſe apophyſes.

WHEN a man ſtands or ſits in an erect poſture, the oblique diſpoſition of theſe *vertebræ* puts the oblique ſides of their articular apophyſes almoſt in a horizontal ſituation, ſo that they ſupport each other

other not only by their bodies, as in the other *vertebræ*, but by their articular apophyſes *

THE obliquity of theſe apophyſes ſeems to eaſe the rotation of the neck, for the natural oblique ſituation of the neck would have made that motion very difficult without the obliquity of the apophyſes. The diſpoſition of the ſecond and third *vertebra*, being more vertical than oblique, the lateral inflexions of the neck are thereby made more eaſy. The holes in the tranſverſe apophyſes of the *vertebræ* of the neck form a canal for the paſſage of the blood-

* Each articulation of the *vertebræ*, except the two uppermoſt, has two centers of motion; one upon the bodies of the *vertebræ*, when the body is bowed forward; and the other at the articulations of the oblique proceſſes, when the body is bowed backward; from which ſtructure the extenſors will have about twice the leaver to act with, and conſequently twice the power to raiſe the trunk to an erect poſture, that they have to carry it beyond that poſture; for then the oblique proceſſes begin to be in the center of motion, and give the ſame advantage to moſt of the benders.

veſſels: the length of this apophyſis in the firſt *vertebra* makes it turn more eaſily on the axis of the ſecond, and the ſhortneſs of theſe apophyſes in the other *vertebræ* prevent them from injuring the neighbouring parts in the lateral inflexions of the neck. The length of the ſpinal apophyſis of the ſecond *vertebra* eaſes the rotation of the firſt: the ſmallneſs of this apophyſis in the three following *vertebræ* prevents them from compreſſing the neighbouring parts when the neck is bent backward; and they are broad and forked, to afford room for the inſertion of the muſcles.

THE *vertebræ* of the *back* ſerve chiefly for the formation of the cavity of the *thorax* by ſuſtaining the arches of the ribs, and this cavity is augmented by the concavity of the whole row of theſe *vertebræ* on the fore-ſide. The length of their ſpinal apophyſes is proportioned to the great number of muſcles inſerted in them. The oblique ſitu-

ſituation of theſe apophyſes, and their lying almoſt cloſe on each other, both prevents the inconveniences of ſo great a length, and hinders the *vertebræ* from being bent backward; and conſequently, helps them to ſupport great weights without ſinking under them.

THE curvature of the tranſverſe apophyſes backward enlarges the capacity of the *thorax*, and gives a peculiar ſort of obliquity to the double articulation of the ribs; without which it is impoſſible to conceive how, by ſimply raiſing the ribs, all the dimenſions of the *thorax* ſhould be increaſed and diminiſhed by lowering them. The articular apophyſes of the back being almoſt vertical, and nearly in the ſame plane, ſmall degrees of flexion and extenſion are thereby made practicable; likewiſe lateral inflexions, but they will not allow of the leaſt rotation. As theſe apophyſes are placed between the tranſverſe and hind extremities of the ribs, they are very little expoſed to ſtrains or ex-

ternal injuries; and thus their ſmall ſize, when compared with the *vertebræ* of the back, becomes ſufficient.

THE gentle curvature of the row of lumbar *vertebræ* counter-balances the different directions of the other parts of the ſpine: the ſhortneſs and ſtraightneſs of their ſpinal apophyſes give room to bend the whole ſpine backward on the loins, and their largeneſs affords ſufficient place for the inſertion of the muſcles: the length of their tranſverſe apophyſes facilitates the actions of the muſcles, but the ſhortneſs of the upper and lower apophyſes prevents their ſtriking againſt the ribs, or *Oſſa innominata* in lateral inflexions. The ſize of the articular apophyſes is proportioned to the great efforts which they often ſuffer in their motions: the direction of theſe apophyſes ſets bounds to the motions of rotation by their meeting, and ſtriking againſt each other; and it is on this occaſion that their ſize becomes neceſſary to enable them

to

to ſuſtain ſuch ſtrokes without breaking.

THE muſcles, inſerted into the ſpinal proceſſes of the *vertebræ* of the neck and loins, will act with more ſtrength than thoſe of the back, becauſe their proceſſes being perpendicular to the ſpine, they therefore are longer leavers: beſides, thoſe of the back touch each other, and prevent much motion, leſt it ſhould interrupt reſpiration; and much motion being neceſſary in the neck and loins, their proceſſes are made fit for it.

THE whole canal of the ſpine, from the firſt *vertebra* of the neck to the extremity of the *Os ſacrum*, may be looked on as an articulated elongation of the *cranium*, ſerving to contain a production of the brain called the ſpinal marrow. This canal is larger in the neck and loins than in the back.

Plate IV. Fig. 1. *SCAPULA*, * F, *Shoulder-blade*, is a large bone, almoſt of a triangular figure, ſituate laterally at the upper and back-part of the *thorax*, from the firſt to the ſeventh rib. The ſubſtance of the *ſcapula* is thin, but ſolid and firm; its outſide is ſomewhat convex, and its inſide concave; its upper edge is called *coſta ſuperior*, and its lower *coſta inferior*; its broad end is called its baſis, which, with the two edges, make the upper and lower angles. The *ſcapula* has three proceſſes; the firſt runs along the middle of their outſide, and is called the ſpine: that end of the ſpine, which receives the extremity of the *clavicula*, is called *acromion*, H. The ſecond proceſs is a little lower than the *acromion*; it is ſhort and ſharp, like a crooked finger, or Crow's bill, therefore called the *caracoide* apophyſis. Theſe two proceſſes are tied to each other by a ſtrong ligament, which keeps the head, K, of the *humerus* in the

* Latitudo humeri, ſcoptulum vel ſcutulum opertum, ſpatula, ala.

the cavity of the third proceſs, called *cervix*. This proceſs is the extremity of the *ſcapula*, which is oppoſite to its baſis. It has a round ſinus tipped about its brim with a cartilage *a*, *a*, which receives the head, D, of the *humerus*. Plate V. Fig. 1.

THE *Scapula* is a *fulcrum* to the arm, and by altering its poſition, according to different exigencies, aſſiſts the motion of the extremity, and affords the muſcles, which riſe from it, more advantageous actions, by changing their direction to the bone they are to move. The *ſcapula* alſo ſerves as a ſhield to defend the *thorax* *.

CLAVICULÆ, † C, C, the *Channel-bones*, are ſituate oppoſite to each other, at the baſis of the neck, and top of the breaſt. Plate III. Fig. 1.

* See in Plate V, Fig. 1. B, the lateral appearance of the outſide of the *ſcapula*; and, in Plate VI, Fig. 1. the left *ſcapula*; where A is the cavity in which the head of the *humerus* is received, B, the lower angle of the *ſcapula*, C; the upper angle, D, the proceſs called *coracoides*, and F, the top of the *ſcapula* called *acromion*.

† *Os jugulare, jugulum, furcula, ligula.*

breaſt. Each clavicle reſembles, in ſome meaſure, S, being a large bone, irregularly cylindrical, bent forward near the *ſternum*, and backward near the *ſcapula*, that which lies on the fore-part of the breaſt being the largeſt. The clavicles are ſtraighter in Women than in Men. *

EACH Clavicle is articulated with the *acromion b*, and *ſternum* D, by *arthrodia*. Their uſe is to fix the *ſcapula* with the *ſternum* and the arms, and to prevent them from ſlipping too forward upon the *thorax*.

COSTÆ, † *Ribs*, are long arched bones, ſituate tranſverſly and obliquely on each ſide of the *thorax*, and ſo diſpoſed, as that their extremities are turned toward each other.

THE

* See in Plate IV, Fig. 1. I, the hind-view; and, in Plate V, Fig. 1. C, C, the ſide-view of the *clavicle*.

† Πλευραὶ, φρενίτις, πλάγιαι.

THE Ribs are twenty-four in number, twelve on each ſide. This number varies, ſometimes on one ſide only, ſometimes in both. Their figure is an imperfect ſegment of a circle, harder, rounder, and more crooked toward their articulation with the *vertebræ* than at the other extremity toward the *ſternum*, which is thinner, broader, and more ſpongy. The ribs are divided into true, or genuine, F, F, or ſpurious, G, G. The true are the ſeven upper pair, which are thus diſtinguiſhed, as forming the moſt perfect arches, and as having a ſtrong articulation with the *ſternum*. Plate III, Fig. 1.

THE five lower are called *nothæ*, or ſpurious, as being ſmaller and ſhorter than the reſt, and not reaching ſo far as the *ſternum*, which makes their articulation very lax; in regard they have long, ſoft cartilages, which bending upward, are joined to the cartilages of the upper ribs.

THE

THE ribs joined to the *vertebræ* of the back and *ſternum* form a cavity, capable of expanſion and contraction, in which are contained the organs of reſpiration, and thoſe of the circulation of the blood*.

Plate III. Fig. 1. *STERNUM*, † D, *Breaſt-bone*: this is the lighteſt, and moſt ſpongy bone in the body; being that which makes the fore-part of the breaſt, is ſituate in the middle of the ribs, and is a long flat bone repreſenting a dagger. In adults, it conſiſts of one ſingle piece; but in infants of three, and ſometimes four pieces. They continue cartilaginous till ſeven years of age, and are not very ſolid afterwards, but ſpongy. At the lower extremity of the *ſternum* is a cartilage, E, called *xiphoides* or *enſiformis*, becauſe reſembling the point of a ſword.

THE

* See in Plate IV. L, L, the ribs in a hind-view, and in Plate V. Fig. 1. E, E, the ribs in a ſide-view.

† *Os pectoris, Os enſiforme, ſcutum cordis.*

THE *ſternum* compleats the fore-part of the cavity of the *thorax*, and ſuſtains the fore-extremities of the ribs, being ſufficiently fixed to reſiſt compreſſions and other outward accidents; and yet moveable enough, by means of its articulation with the cartilages of the ribs, not to obſtruct the motions neceſſary for reſpiration. It likewiſe ſerves for the inſertion of ſeveral muſcles, and to ſupport the *mediaſtinum*, or the duplicature of that membrane, called the *pleura*, which clothes the internal parts of the *thorax* and ribs *.

OSSA INNOMINATA, † K, K, *&c.* when conſidered ſeparate, they have no regular figure, being of different breadths in different parts, unequally convex on the outſide, and unequally concave on the inſide. Plate III. Fig. 1.

THE *Oſſa innominata* are joined to the *Os ſacrum* O, and to each other by a

* See in Plate V, *b*, *b*, the *ſternum*, in a ſide-view.

† *Sacro-conjuncta.*

a cartilaginous *ſymphyſis*, or rather *ſynchondroſis*: They are articulated with the *Os femoris* by *enarthroſis*, and each is ſeparated into three bones, *viz.* *Ilium*, I, I, *Os pubis*, L, L, and *Iſchium*, M, M, joined by cartilages, and appear diſtinct by three lines till ſeven years of age, but grow all into one bone at riper years.

THE *Oſſa innominata* and the *Os ſacrum* form the *pelvis*, which is a part of the cavity of the *abdomen*; eſpecially thoſe which are the common-ſewers of the urine and groſs excrements, and thoſe by which the two ſexes are diſtinguiſhed. The *pelvis* is larger in women than in men; the *Os ilium* and *iſchium* are wider: the arch formed by the branches of the *Oſſa pubis* is greateſt in females.

THESE bones, with the *Os ſacrum*, ſupport the whole trunk, and all the parts belonging to it, and alſo the lower extremities. In ſhort, they are the

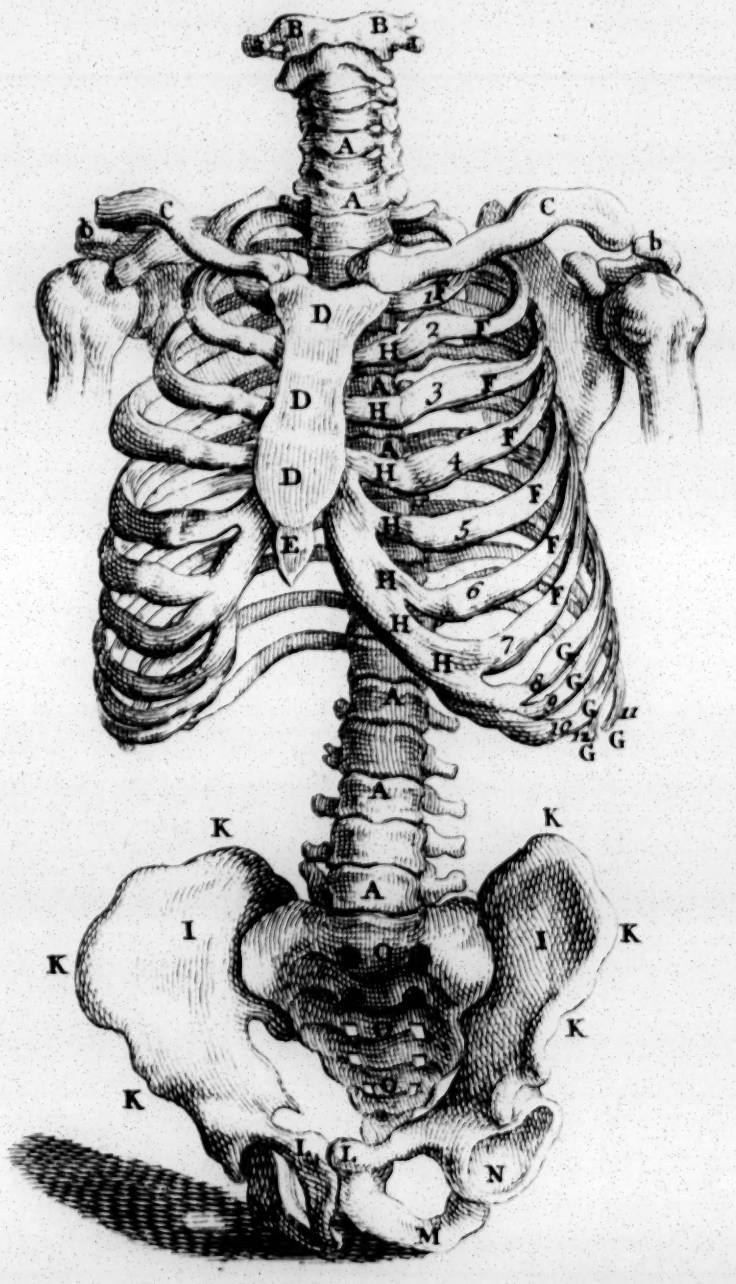
FIG. II.



FIG. III.



FIG. I.

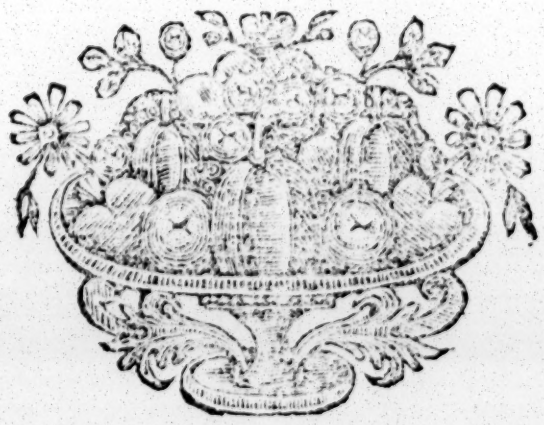


H. Fletcher Sculp.

the baſis of the whole human body, and the general center of all its motions when ſtanding, ſitting or lying *.

* See in Plate IV. Fig. 1. D, the *Os ilium* in a hind-view; and in Plate V. Fig. 1. F, the outſide of the *Os ilium*; G, the *Os ſcarum*; H, the *Os iſchium*; K, the outſide of the *Os pubis* in a ſide-view.

See in Plate VI. Fig. 4. the bones of the *ilium*, *iſchium* and *pubis* without ſide, where A is the outer face of the *Os ilium*; *a*, *a*, the ſpine called the creſt of the *Os ilium*; B, the *Os iſchium*; *b*, the cavity of *iſchium*; C, the *Os pubis*; D, the *foramen* of the *Os pubis*.



SECT.

SECT. V.

Of the BONES *of the* Upper EXTREMITIES.

Plate VI. Fig. 1. OS *HUMERI*, A, the *Shoulder-bone*, is the longeſt and thickeſt bone of the upper extremity. It is ſituate under Plate IV. Fig. 1. the *acromion*, H, along the lateral part of the *thorax*, from which it may be removed to a conſiderable diſtance in all directions. Its figure is irregularly cylindrical, and it is thick at one end, and broad at the other. It has at its Plate VI. Fig. 1, 2, 3. upper-end a large round head, B, X, Y, covered with a ſmooth cartilage, and received into the cavity of the *ſcapula*,* which

* See in Plate IV. Fig. 1. the upper-part, or head, K, of the *humerus* articulated with the *ſcapula*.

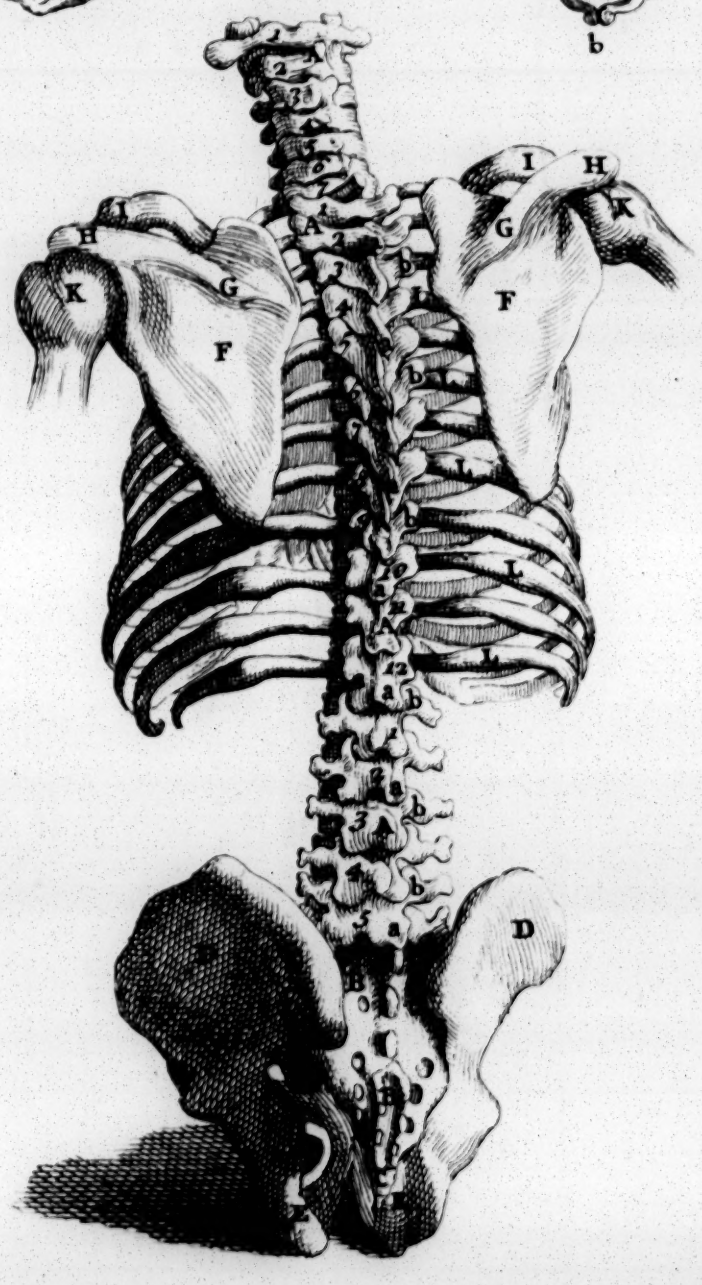
FIG. II.



FIG. III.



FIG. I.



H. Fletcher Sculp.

which makes an articulation by *arthrodia*. This head of the bone being larger than the ſocket, A, into which it is received, the part extant is ſtrictly embraced by a ligament, one edge of which is faſtened to the margin *a*, *a*, of the cartilaginous ſocket of the *ſcapula*, and the other to the lower part of the head of this bone, thereby uniting them firmly together; yet ſo as to leave the motion the freeſt of all the articulations of the body, and therefore liable to diſlocations. At the lower end of the *humerus* are two proceſſes, D, C, or A, A, each covered with a cartilage, the external and leſſer receiving the Extremity, B, of the *radius*, and the internal the head, C, of the *cubitus*.

Plate VII. Fig. 1.

Plate V. and VI.

Plate VI. Fig. 2.

Plate VII. Fig. 2.

THE uſes of this bone are well known, and therefore need no explanation.

Plate VI *and* VII. Fig. 2. *ULNA*, * F, C, ſo called from its being uſed as a meaſure; is irregularly triangular, diminiſhing in thickneſs from one end to the other.

THE ſituation of this bone may be conſidered two ways, either when the fore-arm is extended, and lies along the ſide of the trunk, or, when it is bent, and lies on the lower part of the breaſt. The firſt ſituation is very commodious for determining what parts of the bone are to be called the fore, the hind, the upper, the lower, the external and internal. But the ſecond is moſt natural, as being the moſt common in living bodies, whether ſitting or ſtanding.

Plate VII. Fig. 3. IT has in its upper part a conſiderable cavity called *ſigmoides* or *ſemilunaris*, with an eminence in the middle anſwering the prominences and cavities of the *Os humeri*: alſo a ſuperficial cavity in the external ſide for articulating

* *Cubitus*, Πῆχυς, *Focile majus.*

PLATE V. *Pag. 66*

FIG. I.

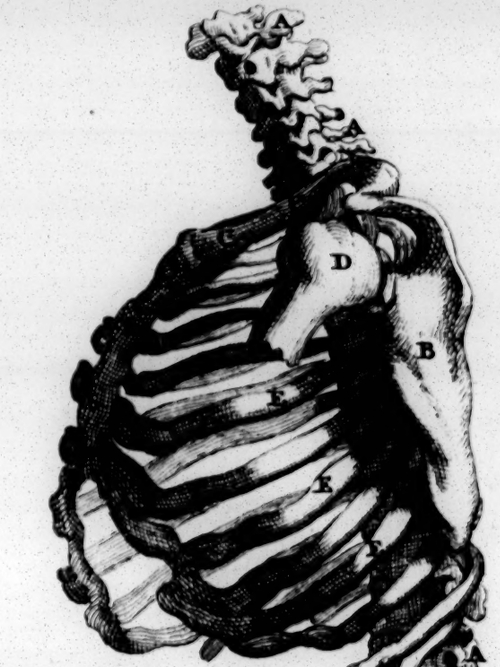
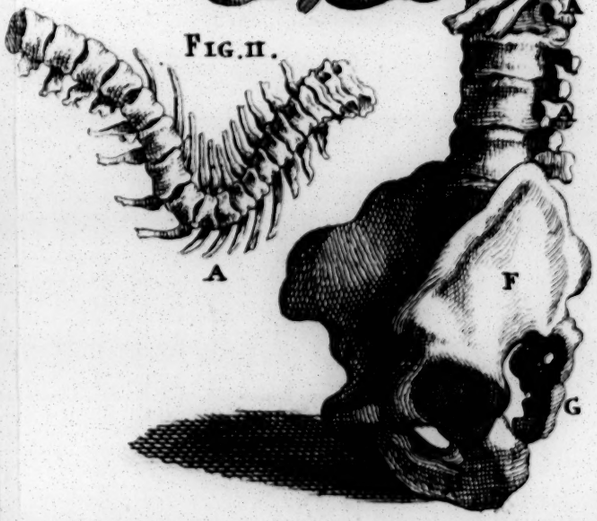


FIG. II.



H. Fletcher Sculp.

culating with the creſt of the *radius*; and two proceſſes, one behind, large and thick, named *olecranon*, which is received into the large hind *ſinus* of the *Os humeri*, and ſtops the arm from going further backward. The other proceſs called *proceſſus anterior*, *ſeu coronoides*, is received into the *anterior ſinus oſſis humeri*; it hinders the arm from being bent too cloſe forward. It has at the lower end a ſmall round head, in which is a cavity for articulating with the *carpus*, a ſmall ſtyloid proceſs for ſtrengthening its articulation with the hands, and a creſt for articulating better with the *radius* *.

RADIUS, † D, which takes its name from the reſemblance it bears to the ſpoke of a wheel, is nearly of the ſame length of the *ulna*, E, bigger at Plate VI. Fig. 3.

* The bones, being disjointed from each other, ſhew the articulation more diſtinctly. A, is the lower extremity of the *humerus*, and B, the place where the *radius* begins to join the *cubitus*.

† Κερχις, ωδαπήχον, *Focile minus*.

one end, *a*, than at the other, *b*, irregularly triangular, a little bent, and ſituate along the ſide of the *ulna*.

THE *radius* is connected with the *ulna*, E, *Os humeri*, A, and *Carpus*, Z; it is articulated with the *ulna* at its two extremities by a double lateral *ginglymus*; the cartilaginous circumference of the head turning in the ſmall *ſigmoide* cavity, and the ſemilunar cavity in the baſis turning on the ſmall head at the lower extremity of the other bone; and thus the ſmall extremity of one bone is joined to the great extremity of the other. It is articulated with the *Os humeri*, by applying the cavity in the top of its head to the ſmall head at the lower extremity of the other bone*. By this conformation it would move in all directions; but, as it is tied to the *ulna* at both extremities, its motions on the ſmall *condyloide* head at the lower extremity of the *Oſſa humeri* are confined to two kinds, *viz.* that

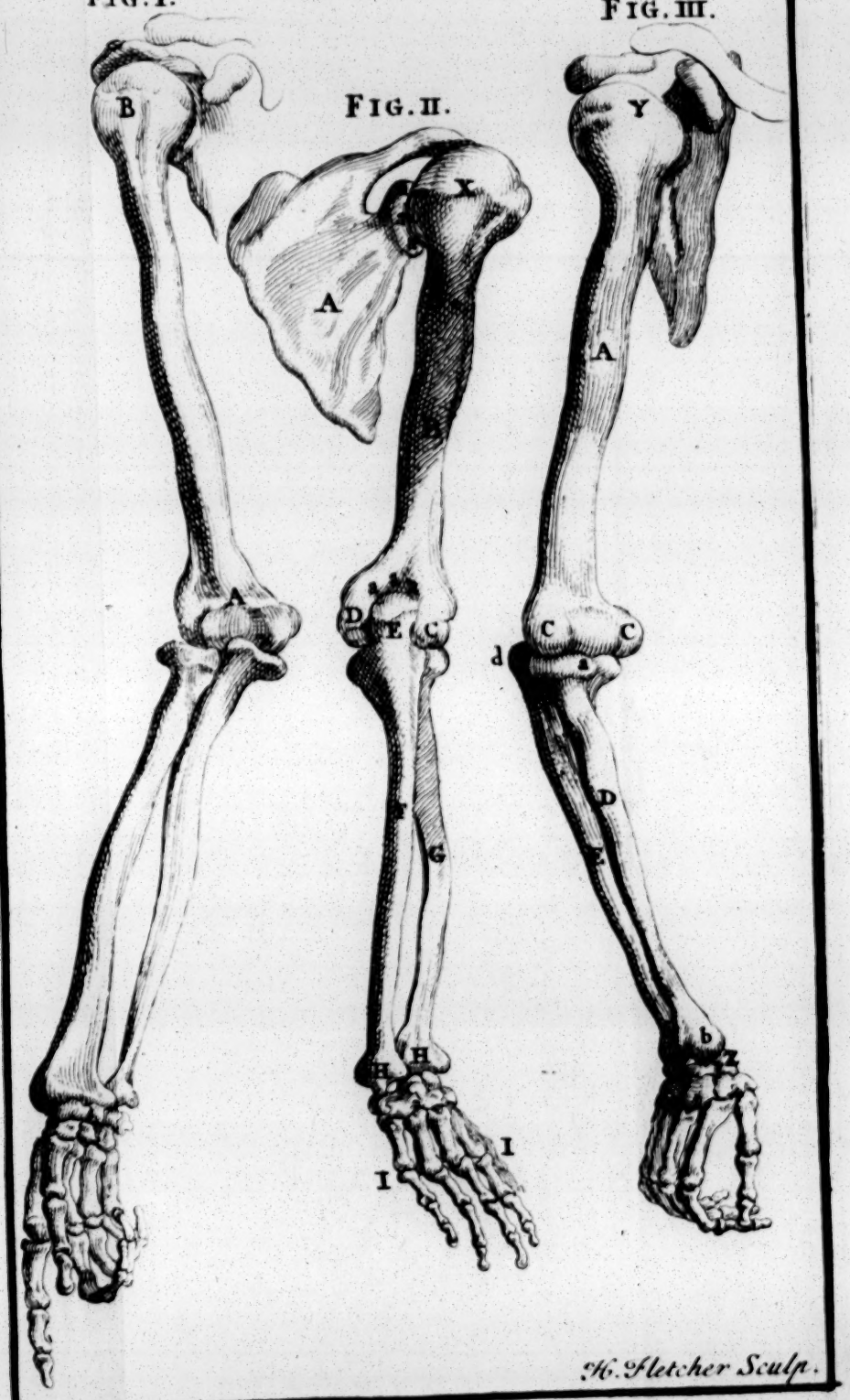
* See Plate VII. Fig. 2, 3.

PLATE VII

FIG. I.

FIG. II.

FIG. III.



H. Fletcher Sculp.

that of rotation, when it turns upon the ſides of the extremities of the *ulna*, and that of flexion and extenſion in common with the *ulna*; and both theſe motions may be performed at the ſame time. See the articulation of the radius with the bones of the *Carpus* in the deſcription of theſe bones *.

The HAND †, comprehends all from the joint of the *wriſt* to the finger-points; all the hind-part is convex, for greater firmneſs and ſtrength, and the fore-part concave, for conveniently and ſurely containing ſuch bodies as we would hold: likewiſe one half has but an obſcure motion, and ſerves as a baſis to the other half, which has forward a large motion, but can be extended back very little farther than a ſtraight line. As the bones that compoſe it are of different ſhapes and uſes, while ſeveral of the adjoining agree in

* Plate VI. Fig. 1. ſhews the right-arm in a hind-view. Fig. 3. the ſame arm in a fore-right ſituation.

† Ακρόχειρ, *ſumma manus.*

ſome general characteriſtics; the hand
Plate VIII Fig. 1, 2. is therefore divided into the *carpus*, A, *metacarpus*, B, and fingers, C, among which the thumb is reckoned.

OSSA CARPI, the *Wriſt-bones*, are eight ſmall, unequal, and irregular bones; and all taken together repreſent a grotto of an irregular quadrangular figure, and chiefly connected with the baſis of the *radius*.

THE bones of the *carpus* are divided into two rows, the firſt lies next the fore-arm, the ſecond next the *metacarpus*. Each row conſiſts of four bones, but the fourth of the firſt row lies out of its rank.

Plate VIII Fig. 1, 2. THE bones of the *carpus* are, 1. *Os ſcaphoides*. 2. *Os lunare*. 3. *Os cuneiforme*. 4. *Os piſiforme*. 5. *Os trapezium*. 6. *Os trapezoides*. 7. *Os magnum*. 8. *Os unciforme*.

OS

PLATE VII. *Pag. 70*

FIG. I.

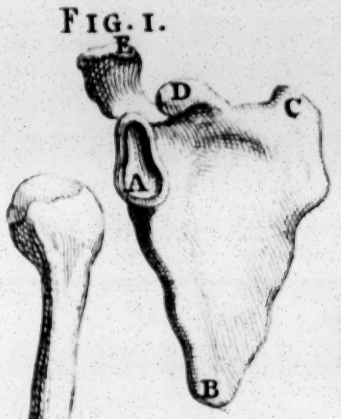


FIG. II.

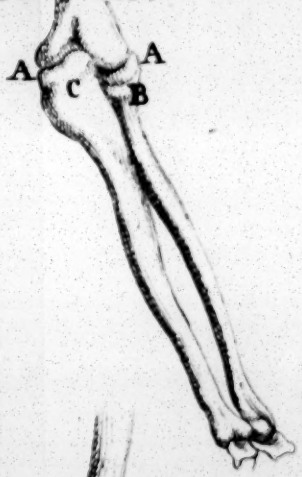


FIG. III.



FIG. IV.

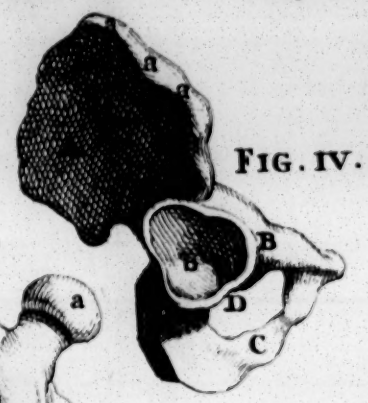


FIG. V.

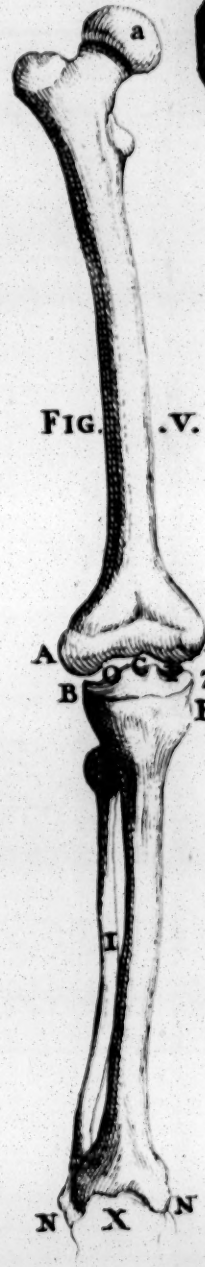


FIG. VI.



W. Fletcher Sculp.

(1.) *OS SCAPHOIDES* *, the firſt bone of the firſt row, ſo termed from its reſemblance to a ſmall boat: it has next the *radius* a convex-ſide by which it is articulated with the baſis of that bone, and a tubercule, which is one of the four eminences on the concave ſide of the *carpus*. It has toward the trunk two half ſides, a large one for the *Os trapezium*, and a ſmall one for the *Os trapezoides*. It has a hollow ſide for the *Os magnum*, and a ſide like a half moon for the *Os lunare*. The inner and outer ſurfaces are rough.

(2.) *OS LUNARE*, the ſecond bone of the firſt row, ſo called from the reſemblance one of its ſides has to that of a creſcent. The articular ſides of this bone are four, *viz.* one convex for the baſis of the *radius*, one ſemilunar for the *Os ſcaphoides*; one almoſt triangular for the *Os cuneiforme*, and one hollow, which with the hollow ſide of the *ſcaphoides*, forms a

* *Naviculare.*

cotyloide cavity for the head of the *Os magnum*. The convex ſide, with that of the *Os ſcaphoides*, forms an oblong convexity anſwering to the oblong concavity in the baſis of the *radius*. The outer and inner ſurfaces are ſmall and rough.

(3.) *OS CUNEIFORME*, the third bone of the firſt row, ſo called from its reſembling a wedge ſticking between the two rows. It has a rough ſurface with a ſmall tubercle on it, which forms the greateſt part of the cubical edge of the *carpus*, and four articular ſides, whereof one is convex, which compleats the articular convexity of the *carpus* : one orbicular and internal, on which the *Os piſiforme* is ſet ; and two making an angle between them ; one for the *Os ſemilunare*, and the other for the *Os unciforme*.

(4.) *OS ORBICULARE* *, the fourth bone of the firſt row, ſo called from its figure

* *Piſiforme, lenticulare, cartilaginoſum.*

figure and ſize, which is irregularly round. It has but one cartilaginous ſide irregularly round, the circumference of which repreſents a narrow collar: the reſt of the bone is rough, convex, and irregularly round, making one of the four eminences on the concave ſide of the *carpus* *.

(5.) *OS TRAPEZIUM*, the firſt bone of the ſecond row, ſo called, becauſe its figure is an unequal ſquare. Its outer ſurface is rough, and makes a part of the convex ſide of the *carpus*. It has ſeveral articular cartilaginous ſides, *viz.* one brachial, one digital, and two cubital ſides. The brachial ſide is hollow, and is articulated with the *Os ſcaphoides*; the digital, with the firſt phalanx of the thumb; one of the cubital ſides with the *Os tra-*

* This bone and the *Os cuneiforme* may be ſuppoſed to make a third row, diſtinct from the other two.

The four bones of the ſecond row lie all in a line, the firſt being joined to the thumb, and the reſt to the *metacarpus*.

trapezoides, and the other with the firſt bone of the *metacarpus*.

(6.) *OS TRAPEZOIDES*, the ſecond bone of the ſecond row, is a kind of a pyramid with the point broke off. Its baſis makes a part of the convex ſide of the *carpus*, and its point is a part of the concave ſide. It has ſeveral articular ſides, *viz.* one brachial, articulated with the *Os ſcaphoides*; one digital, articulated with the baſis of the firſt metacarpal bone; one radial, articulated with the *Os trapezium*; and the one cubital, articulated with the *Os magnum*.

(7.) *OS MAGNUM*, the third bone of the ſecond row, ſo called, becauſe it is the largeſt of all the bones of the *carpus*. It has a kind of articular round head, which is received into the *cotyloide* cavity formed by the two firſt bones of the firſt row, and this articulation is capable of a ſmall degree of flexion and extenſion. The digital

digital ſide is a cartilaginous baſis unequally and obliquely triangular, the *apex* being turned inward. It is articulated with the ſecond metacarpal bone, and is a little notched on the *radial* edge for its articulation with the ſmall edge of the firſt metacarpal bone. The radial ſide is ſmall, and near the baſis, being articulated with the *Os pyramidale*. The cubital ſide is double, and is articulated with the *Os unciforme*. The outer ſurface, which forms a part of the convex ſide of the *carpus*, is broad, rough, and uneven for the inſertion of ligaments.

(8.) *OS UNCIFORME*, the fourth bone of the ſecond row, in form of a hook, from whence it has the name. The hooked apophyſis of this bone is flat, and the hollow ſide of its curvature turned toward the *Os magnum*.

THE outer ſurface of its body is rough, and almoſt triangular: it compleats the convex ſide of the *carpus*, and

and toward the *ulna* terminates in a ſmall tuberoſity; which is all the cubital ſide of this bone.

IT has three articular or cartilaginous ſides, one radial, one brachial, and one digital. The radial ſide is double, anſwering to the cubital ſide of the *Os magnum*; the brachial ſide is oblique, ſome part of it being concave, the reſt convex, anſwering to the digital ſide of the *cuneiforme*; the digital ſide is diſtinguiſhed into two halves by a ſigmoide angular line, for its articulation with the two laſt bones of the *metacarpus*.

IN deſcribing the preceding eight bones, we have only mentioned thoſe plain ſurfaces covered with a proper cartilage, whereby they are articulated with each other, or to ſome other bones, except in a few caſes where ſomething extraordinary was to be obſerved; and have deſignedly omitted the other rough ſurfaces, leſt by crowding

ing two many words in deſcribing ſuch ſmall bones, the whole ſhould be unintelligible; while theſe parts of the bones may, after mentioning the figure, be eaſily conceived, by obſerving that they are found toward the back or palm of the hand, that they are all plain, larger behind than before, and receive the different ligaments, by which they are connected to the neighbouring bones, or to one another: for theſe ligaments cover all the bones, and are ſo accurately applied to them, that at firſt view the *carpus* appears one ſmooth bone.

THE bones of the *carpus* are articulated with each other by *arthrodia*; but the firſt row forms a ſort of *ginglymus* with the ſecond, becauſe the head of the *Os magnum* may turn in the *cotyloide* cavity of the firſt row, while the two firſt bones of the ſecond row ſlide upon the digital ſide of the *Os ſcaphoides*, and the *Os unciforme* in the ſame manner on the *Os cuneiforme*.

WHEN

WHEN all theſe bones are in their natural ſituation, a tranſverſe depreſſion is formed on the convex ſide of the *carpus*, by which the two rows are diſtinguiſhed; this depreſſion appears moſt between the *Os ſcaphoides* and the three laſt bones of the ſecond row, and looks like a kind of fold, by which the ſecond row is thrown back upon the firſt. The four eminences on the concave ſide of the *carpus* are for the inſertion of a ſtrong tranſverſe ligament. The inner ſubſtance of all theſe bones is ſpongy, and their ſurfaces are not compact.

Plate VIII Fig. 1, 2. *ſhew the internal and external views of the left hand.*

METACARPUS *, B, is the ſecond part of the *Hand*, ſituate between the *carpus* and fingers, and conſiſts of four bones, *a*, *a*, *&c.* one ſide of which forms a broad cavity, called the palm of the hand, the other a convexity called the back of the hand.

THE

* Κλεὶς, σπόθ, ἄνθεμον, κλινίον, *poſtbrachiale, pectus, palma, pecten.*

THE bones of the *metacarpus* are long, thicker at the extremities than the middle, and of unequal length and bigneſs. The firſt is the largeſt, the reſt are leſſened by degrees in all their dimenſions: the two firſt are ſometimes, tho' very rare, equal.

EACH bone is divided into the extremities and middle part, or into a baſis, body and head. The baſes are angular, and turned toward the *carpus*, the heads round like condyles, and turned toward the fingers, and both covered with cartilages.

THE body of each bone is contracted of a triangular figure, and diſtinguiſhed into three ſides, whereof one is external and convex, contributing to make the back of the hand; the other two internal and concave, one being turned obliquely toward the *radius*, the other toward the *ulna*. Theſe three ſides are ſeparated by the ſame number of angles, and that angle which parts the two

in-

internal ſides, is acute. It is by theſe two ſides, and the angle between them, that the hollow of the palm of the hand is formed.

THE firſt bone of the *metacarpus* is longer, thicker, and bigger than any of the reſt, and ſupports the fore-finger; its baſis is hollow, anſwering to the digital ſide of the *Os pyramidale* of the *carpus*. On the outer edge there is an angular notch, and on the cubital edge of the baſis a ſmall lateral ſide, which is articulated with the baſis of the ſecond bone. The inner edge is laterally terminated by an oblique angle, which is articulated with the neighbouring angle in the baſis of the *Os magnum*.

THE ſecond bone of the *metacarpus* ſupports the middle finger, and has this peculiar to it, that its baſe is very oblique, terminating at the outer edge by an angular point turned toward the firſt bone. By the triangular ſide of its

PLATE VIII

Pag. 80

FIG. I

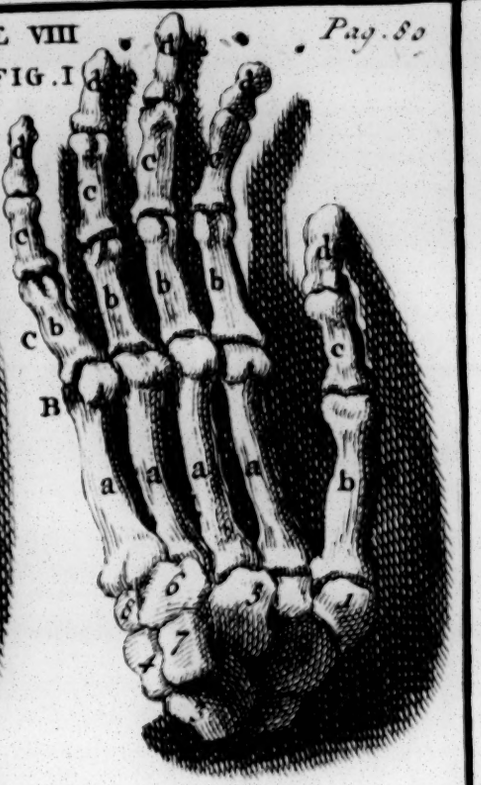


FIG. II

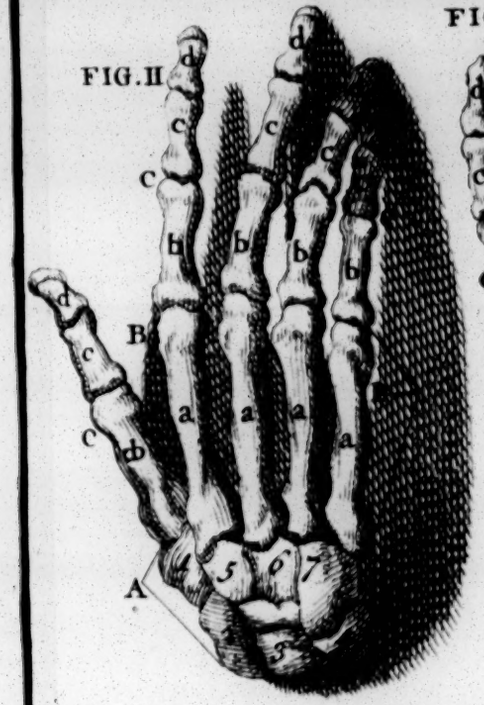
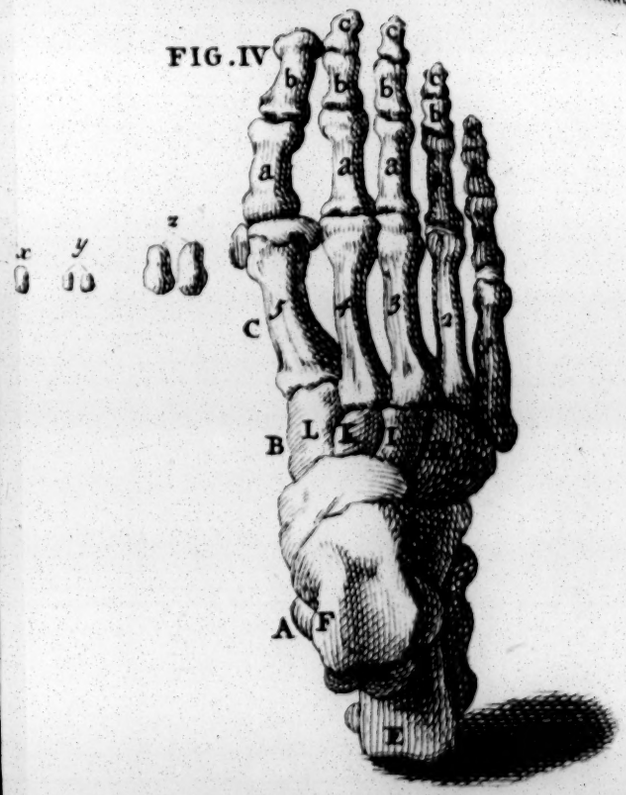


FIG. IV



H. Fletcher Sculp.

its baſis it is articulated with the baſis of the *Os magnum*, and by its lateral ſides with thoſe of the firſt and third bones of the *metacarpus*.

THE third bone of the *metacarpus* ſupports the *Ring-finger*, being leſs than the firſt and ſecond. Its baſis is irregularly triangular, and proportionably leſs than the two former; and by the principal ſide thereof it is articulated with the firſt half of the ſide of the *Os unciforme*. The ſmall lateral ſides of the baſis join thoſe of the ſecond and fourth bones of the *metacarpus*.

THE fourth bone of the *metacarpus* ſupports the little finger; the principal ſide of its baſis is all of an equal breadth, a little oblique, and ſome part of it convex, the reſt concave, and articulated with the ſecond half of the ſide of the *Os unciforme*. By its lateral ſide it joins the correſponding ſide of the baſis of the third bone, but in a looſer manner than in the other articulations of the like kind.

Plate VIII Fig. 1, 2. THE FINGERS, *b*, *b*, *&c.* make the third part C of the hand, and terminate the whole upper extremity. They are in each hand five in number, *viz.* the thumb, the fore-finger, the middle finger, the ring-finger, and the little finger.

EACH finger conſiſts of three pieces, called *phalanges*, *b*, *c*, and *d*, the firſt of which is longer and thicker than the ſecond, and the ſecond than the third: and each *phalanx* is divided into a baſis, middle part, and head, into two ſides, one convex, and the other concave, and into two edges.

Fig. 2. THE convex ſide of the firſt *phalanx*, *b*, of the thumb is flat, and broader at the head than at the baſis. The articular ſide of its baſis is proportioned to the digital ſide of the *Os trapezium* of the *carpus*, and ſo framed that the ſigmoide cavities and eminences in both bones croſs each other.

THE

THE body of the ſecond *phalanx*, C, of the thumb is convex, or ſemicylindrical on one ſide, flat on the other, and contracted between the edges: the articular ſide of the baſis is concave, the head is a part of a pulley, which projects more on the concave than on the convex ſide. The connection of this *phalanx* with the firſt, is by a kind of *arthrodia*, which permits a motion in ſeveral directions, tho' more limited than in other articulations of the ſame kind. It is articulated with the third by a perfect *ginglymus*.

THE third *phalanx*, *d*, of the thumb repreſents half a cone cut lengthwiſe: the convex ſide is more even than the flat ſide, and on each ſide there is a tuberoſity near the baſis. The baſis has two hollow ſides which form a *ginglymus* with the head of the ſecond *phalanx*. The head is ſmall and flat, ending in a rough ſemicircular border, which, on the flat ſide of the bone, repreſents a horſe-ſhoe.

THE other four fingers in general, and their *phalanges* in particular, are all nearly of the ſame ſtructure, differing chiefly in ſize. The fore and ring-fingers are almoſt equal, only the fore-finger is a little bigger, and ſhorter than the other. The middle finger is the longeſt, and the little finger the leaſt. The ſame proportions are to be obſerved in their *phalanges.*

THE firſt *phalanges*, *b*, *b*, &c. of the four fingers are nearly made in the ſame manner with the ſecond of the thumb, only they are longer in proportion, flatter on the concave, and more round on the convex ſides. The baſes are more hollow for their articulation with the heads of the metacarpal bones, and their heads are like pullies, as in the ſecond bone of the thumb.

THE ſecond *phalanges*, *c*, *c*, &c. are ſhorter, narrower, and thinner than the firſt. Both *phalanges* are a little crooked, and reſemble each other in ſtructure, except

except that the ſecond contract by degrees, from their firſt baſis to the heads which are very ſmall; and that their baſis have a double cavity for their articulation by a *ginglymus* with the heads of the firſt *phalanges*.

THE third *phalanges*, *d*, *d*, are every way like that of the thumb, but ſmaller, each of them being proportioned to the fingers they belong.

IT is to be obſerved concerning all the *phalanges*, that their baſes have ſmall tuberoſities, and their heads, except thoſe of the laſt *phalanges*, have on each ſide a round ſort of *foſſula*, bordered with ſmall eminences.

The particular ſituation and uſes of the bones of the upper Extremities.

THE Hand is repreſented in skeletons and figures as lying in the ſame plane, and in the ſame longitudinal direction with the bones of the fore-arm. This gives a falſe idea of its true ſituation: as to the fore-arm, it is oblique in two reſpects; for the breadth of the

hand makes an angle with the breadth of the fore-arm, and the thickneſs of the hand at the ſame time with the thickneſs of the fore-arm, *viz.* that part of the fore-arm which is next the hand.

THIS is owing to the ſtructure and ſituation of the bones of the *carpus*, and to their connection with thoſe of the fore-arm.

(1.) THE two rows of theſe bones make a tranſverſe fold on the convex ſide of the *carpus*, and the articular brachial ſides of the two firſt bones of the firſt row are a little turned toward the ſame convex ſide of the *carpus*, which obliges the whole hand to be a little bent back in its natural ſituation.

(2.) THE edge of theſe bones next the *ulna* is much ſhorter than that next the *radius*, which makes the cubital edge of the whole hand incline to that ſide. By not conſidering this, a void ſpace is left in skeletons, between the ex-

extremity of the *ulna* and *Os cuneiforme* of the *carpus*.

In this oblique and natural ſituation of the hand, the fingers being extended and ſeparated, the extremity of the fore-finger will anſwer to the interſtice between the bones of the fore-arm. By this diſpoſition of the bones, the hand may be lengthened, flatted, ſhortened, and contracted; it is lengthened, or widened, and flatted, by extending the fingers, and turning back the thumb, and ſhortened by bending the fingers. The hand is contracted by inclination of the thumb, and the eaſy motion of the fourth metacarpal bone: and if we bend, or preſs the fingers cloſe together, we both ſhorten and contract the hand, and thereby form a hollow.

The *Thumb* is differently ſituate from the other fingers; the fingers have nearly the ſame direction with the plane of the *metacarpus*; but the thumb being in its natural ſituation, and free from the action of all its muſcles, its

convex ſide anſwers to the convex ſide of the *radius*, and its flat ſide is turned toward the little finger; and the firſt *phalanx* makes an hollow angle with the *radius*, and a prominent angle with the ſecond *phalanx*; but both this and the third *phalanx* lie in a ſtraight direction like that of the fore-arm.

THE *Carpus* is the baſis and centre of all the motions of the hand, except that of rotation; by which we can bend the hand in all directions, but more eaſily toward the ſides and edges than any other way.

THE *Radius* is the handle of the hand, and it is by it that we can move the hand reciprocally as on an axis, turning either edge of it toward the body. In the natural and moſt ordinary ſituation of the hand, the palm is turned toward the body and not the edges; and this diſpoſition of the hand determines the true ſituation of the *radius*, which is not on one ſide of the *ulna* in

in a parallel direction, as figures and ſkeletons commonly repreſent it, but the *radius* in ſuch a manner croſſes the *ulna* obliquely, as that the *ſtyloide apophyſes* in both bones are directly over againſt each other, and this is its true and natural ſituation.

THE *Ulna* ſupports the handle of the hand, without being articulated with the hand. Two lateral *ginglymi* and ſtrong ligaments cloſely connect the *radius* with it, ſo that in the moſt violent motions, the two bones cannot be ſeparated. When we puſh or preſs any thing with the hand, the whole force is ſuſtained by the *radius*, the baſis of which ſupports the wriſt, and its concave head is ſtrongly preſſed againſt the ſmall inferior head of the *Os humeri*. The oblique direction of the pulley of the *ulna*, is the reaſon, that, in bending the fore-arm upward, the extremity of the bone is naturally turned toward the *thorax*, and with difficulty toward the articulation of the *ſcapula*.

SECT.

SECT. VI.

Of the BONES *of the lower Extremities.*

Plate IX. Fig. 1, 2.

OS *femoris* *, A, A, the thigh, is the biggeſt and longeſt bone of the body: its figure is almoſt cylindrical, and a little bent in the middle. It lies in the ſame direction with the trunk; only a little oblique, in ſuch a manner, as that the upper parts of the two bones are farther diſtant from each other than the lower. It is divided into three parts, the upper, middle, and lower †.

THE upper conſiſts of a head B, and neck Z, in which are contained three epiphyſes, *viz.* the extremity or head, which

* Μηρὸν, *Femen, coxa, agis.*

† Fig. 1. ſhews the thigh, leg and foot in a front view; and Fig. 2. repreſents them in an outſide view.

which is round and big, and received into the *acetabulum* N of the *coxendix* *, wherein it is tied by two ligaments, the one from the head, and the other from the bottom of the *acetabulum*, but both inſerted into the middle of the head. Plate III. Fig. 1.

IMMEDIATELY under the head B, is the neck Z, which is ſmall, long, little, oval, and makes an angle with the body of the bone, by means whereof the thighs and feet are kept at a due diſtance from each other, to make us ſtand the firmer; beſides the obliquity of the neck conduces to the ſtrength of the muſcles, which otherwiſe muſt have paſſed too near the center of motion. Plate IX. Fig. 1.

THE two *epiphyſes* are called the greater C, and leſs D, *trochanters*.

THE middle part, or ſhank of the thigh-bone is round, ſmooth, and poliſhed

* See Plate VII, where *a*, Fig. 5. the head of the thigh-bone articulates by entering within the cavity *b*, Fig. 4. of the *Iſchium*.

liſhed on its fore-ſide, and rough on the hind-ſide, along which runs a ſmall ridge the whole length of the bone, called the *Linea aſpera*, ſerving for the inſertion of muſcles.

Plate VII. Fig. 5. THE lower part of the thigh-bone is divided by a *ſinus* in the middle, into two heads or apophyſes, A, A, called *condyli*, which make the abovementioned *ginglymus*, being both received into the *ſinus* of the *tibia*.

THIS bone is ſpongy at the extremities, and hollow in the middle; the cavity being filled with a reticular ſubſtance, and parts of the *laminæ* brought from each ſide.

Plate VII. *and* IX. Fig. 6. 1. *PATELLA**, the knee-pan, A or F, is a ſmall bone ſituate above the ſpine of the *tibia*, reſembling a large cheſnut. It is about half as thick as long, and its length and breadth are nearly equal; over it ſlide the tendons of

* Επιμυλὶς, μυλακρὶς, κόγχος, ἐπιγονατὶς, *rotula, mola, genu, ſcutiforme os.*

of the muſcles, which extend the leg as on a pulley. But its chief uſe is to hinder the leg from being bent forward in extenſion, which would certainly be the caſe in this articulation, did not this bone, like a bolſter, check its rolling forward, as the *olecranon* E, or elbow does the ſwing of the *cubitus* backward. In an erect poſture, when one foot is ſet forward, the whole weight of the body bears on the *patella*, which in this ſituation hinders the knee from bending backwards, and ſtraining the muſcles that bend it behind. It is connected with the tuberoſity of the *tibia* by a thick, ſtrong ligament.

Plate VI. Fig. 2.

*TIBIA**, G, G, the ſhank-bone, is a long, hard and firm bone, irregularly triangular, and larger at the top than below, having a large cavity in the middle to contain the *medulla*. It is ſituate perpendicularly between the thigh and the foot; its fore and ſharp edge is called

Plate IX. Fig. 1, 2.

* Πηχυνήμιον, ἀνλιχνήμιον, *focile majus, arundo major, canna major, canna domeſtica cruris.*

called the ſhin; in its upper extremity, it has two large *ſinus*'s O, P, tipped with a ſoft and fine cartilage, from its figure called *cartilago lunata*; which runs in between the extremities of the two bones, and grows very thin at its edge, ſerving to facilitate a ſmall ſide motion in the knee, like thoſe in the articulation in the lower jaw.

Plate VII. Fig. 5.

THE *ſinus*'s receive the two protuberances A, A, of the thigh-bone; and the production, C, which is between the *ſinus*'s of the *tibia*, is received into the *ſinus* which divides theſe two protuberances of the thigh-bone.

BY bending the knee we bring the leg in walking, in a ſtrait line forward, which could not have been done without this articulation; but like thoſe, who are unfortunate to have a wooden leg, we muſt have brought the foot about ſemicircularly, even in going on a plain, but more evidently on an aſcent.

ON

PLATE IX. Pag. 94

FIG II.

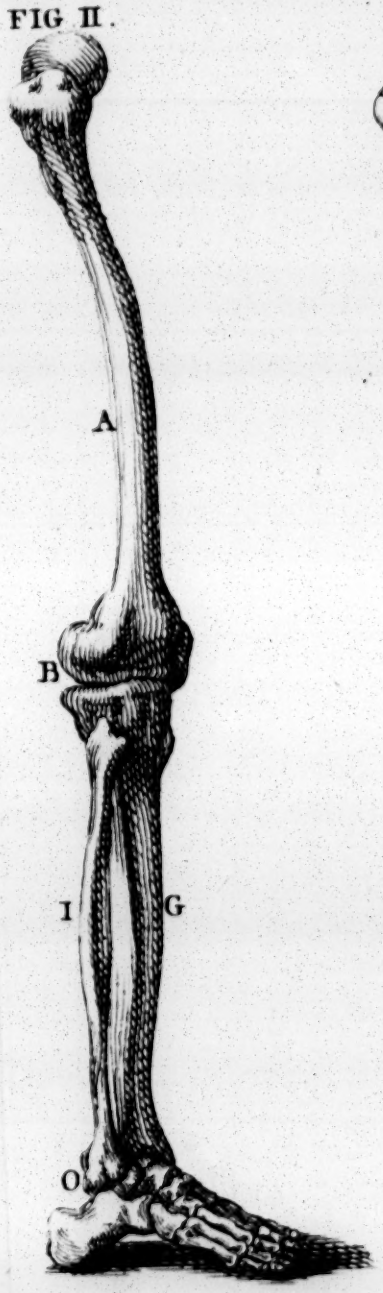
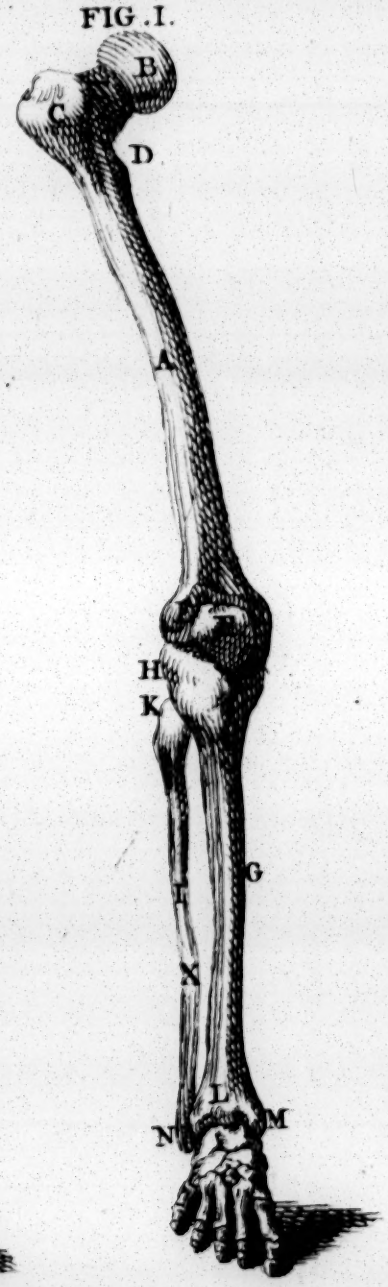


FIG. I.



H. Fletcher Scu.

ON the ſide of this upper end, it has a ſmall knob, B, or H, which is received into a ſmall *ſinus* of the *fibula*; and on its fore-part, a little below the *patella*, F, it has another, Z, into which the tendons of the muſcles of the leg are inſerted. Its lower extremity, which is much ſmaller than its upper, has a remarkable proceſs, M, called *malleolus internus*, which forms the inner ankle; and a large *ſinus*, X, divided in the middle by a ſmall protuberance; the *ſinus* receives the convex-head of the *aſtragalus*, and the protuberance is received into the *ſinus*, in the convex-head of the ſame bone. Plate VII. *and* IX. Fig. 5, 1.

IT has another ſhallow *ſinus* N, in the ſide of its lower end, which receives the *fibula* *.

FIBULA,

* Mr. *Cheſelden* gives an inſtance of a boy of ſeven years of age, where both the *epiphyſes*, at the upper end of the *tibiæ*, were ſo far ſeparated, that not more than half each *tibia* was joined to half the *epiphyſis*, which made his legs wholly uſeleſs. This had been occaſioned by the nurſe's holding him out to ſtool by the heels and back, when very young; which is a practice too common among them.

Plate VII. *and* IX. Fig. 5. 1, 2. *FIBULA* *, I, is a long ſmall bone, irregularly triangular, lying on the outſide of the *tibia* G, almoſt oppoſite to the external poſterior angle, bur a little more backward. It is divided into three parts; the upper, K, which is a round head terminating a little below the knee, and receiving a lateral protuberance, H, of the *tibia* into a ſmall *ſinus*; whereby the articulation of this part is effected: the middle, X, is very ſlender, long, and triangular like the *tibia*, but ſomewhat more irregular. The lower part, O, is received into a *ſinus* of the *tibia*, and then ſhoots out into a large proceſs called the outer-ankle. It is a little hollow on the inſide, to give liberty for the *aſtralagus* to move, and a little convex on the outſide, that it may have the more ſtrength to retain the *aſtragalus*.

THE *tibia* and *fibula* only touch at the two extremes, like the *radius* and *ulna*:

* Παεξηνήμιον, *Perone, focile minus, arundo minor, canna minor cruris, ſura.*

PLATE X. Pag. 96

FIG. II.

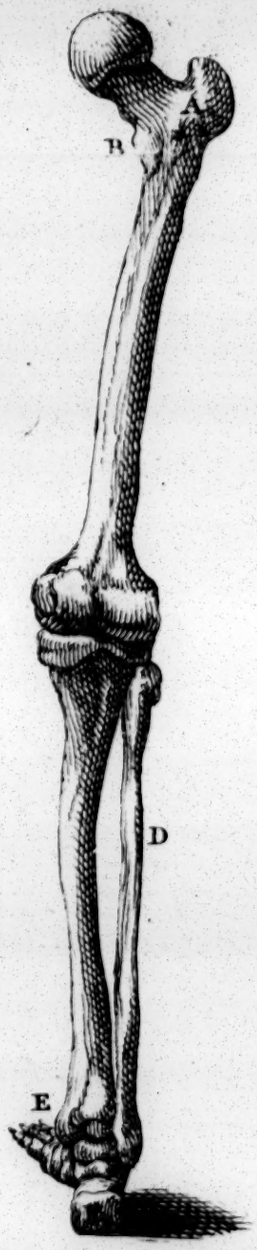
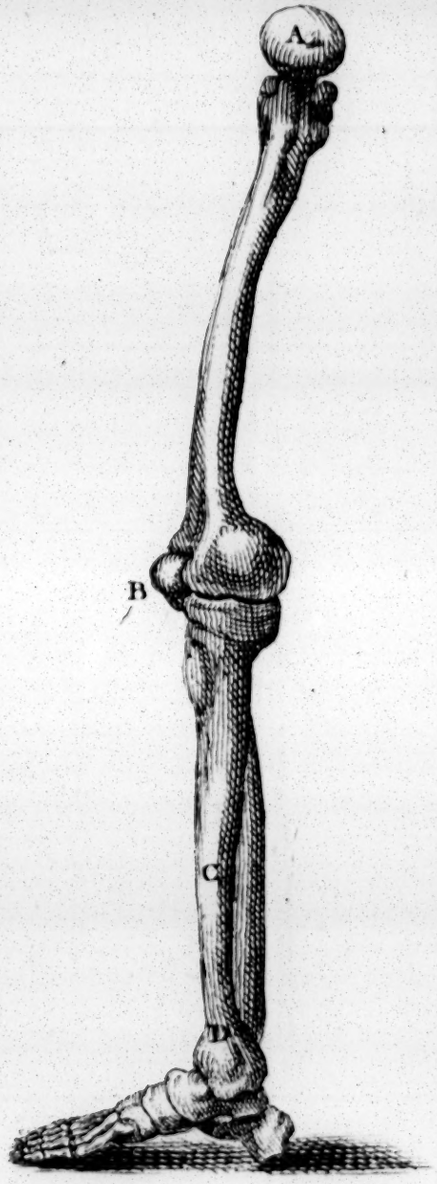


FIG. I.



H. Fletcher Scu.

ulna: the ſpace between them is filled up with a ſtrong membranous ligament, which ties them together, and ſtrengthens the *articulation* *.

THE *Foot*, like the *Hand*, is divided into three parts, the *tarſus*, *metatarſus*, and the *toes*.

THE *Tarſus*, B, conſiſts of ſeven ſpongy bones, *viz.* the *aſtragalus*, F, *Os calcis*, E, *Os ſcaphoides*, G, *Os cuboides*, H, and the three *Oſſa cuneiformia*, I, K, L, †. Plate VIII *and* XI. Fig. 3, 4. *ſhew the left foot in an upper and under view.*

* The ſame bones already deſcribed are repreſented in Plate X. but in different ſituations. Fig. 1. ſhews the bones in an inſide view; A, is the head of the *femur*; B, the *patella* or *rotula* of the knee; C, the *tibia*; D, the *malleolus internus*. Fig. 2. gives a hind view of the bones; A, the larger proceſs of the *femur*; B, the proceſs called the *trochanter*; D, the *fibula*, one of the bones of the legs; E, the *malleolus internus*; F, the *Os calcis*.

† In Plate VIII. and XI. and Fig. 3, and 4, A, are the *Oſſa innominata* called the *calcaneum*; and in Plate XI. Fig. 4, and 5, A is the inner-ſide, and B the outer ſide view of the left foot.

(1.) *ASTRAGALUS* *, F, the ankle bone, is the firſt bone of the foot, which has in its upper part a convex head articulated with the *tibia* and *fibula* by *ginglymus*, it being divided by a little *ſinus*, which receives the ſmall protuberance in the middle of the *ſinus* of the *tibia:* without this articulation, we muſt always in going, have trod on the heel with the fore-foot, and toes with the hind-foot.

THE fore-part of the *aſtragalus*, which is alſo convex, is received into the *ſinus* of the *Os naviculare*. Below, toward the hind part of its under-ſide, it has a pretty large *ſinus*, which receives the upper and hind part of the *Os calcis*; and toward the fore part of the ſame ſide it has a protuberance, which is received into the upper and fore part of the ſame bone: betwixt this *ſinus* and this protuberance, there is a cavity anſwering to another in the *Os calcis*, wherein

* *Talus, baliſtæ os,* ἀστράγαλος.

wherein is contained an oily and ſlimy ſort of ſubſtance, for moiſtening the ligaments, and facilitating the obſcure motion of theſe bones in going.

(2.) *OS CALCIS* *, E, the heel-bone, is the ſecond and largeſt bone of the *tarſus*, lying under the *aſtragalus*, to which it is articulated by *ginglymus*; behind it, is a large protuberance which makes the heel, into which the *tendo Achillis* is inſerted; and before it has a cavity, which receives a part of the *Os cuboides*.

(3.) *OS SCAPHOIDES* †, G, reſembles a little flat boat; it is the third bone of the *tarſus*, and lies before the *aſtragalus*.

IT is joined to the ankle-bone and three hinder bones.

* Πτέρνα, *Calcaneum, calcar pedis.*
† *Os naviculare, cymbæ.*

(4.) *OS CUBOIDES* *, H, or a maſs of ſix ſides, all very unequal and irregular, and from theſe it has its name. It is the ſeventh bone of the *tarſus*, and lies in the ſame rank with the *Oſſa cuneiformia*; behind, it is joined to the *Os calcis*, before to the two outer bones of the *metatarſus*, and its inſide is articulated with the *Os cuneiforme*.

(5.) *OSSA CUNEIFORMIA*, the fourth, I, fifth, K, and ſixth, L, bones of the foot; thus called from their wedge-like ſhape, being large above and narrow below. They lie all three aſide of one another, and are of different ſizes; their upper ſide convex, and their under hollow, by which means, the muſcles and tendons in the bottom of the foot, are not hurt in walking. At one end they have each a *ſinus*, which receives the *Os naviculare*, and at the other

* Πολύμορφον, *cubiforme, quadratum, grandinoſum, varium.*

other end are joined each to one of the three inner bones of the *metatarſus*.

*METATARSUS**, C, the middle part of the foot, conſiſts of five bones, 1, 2, 3, 4, 5. reaching from the heel to the toes, which form a kind of a grate, and are inclined in the ſame manner with the arch of the *Os cuboides*, and *Oſſa cuneiformia*. Theſe bones are larger than the bones of the *metacarpus*; in other things, they are like them, and are articulated with the toes, as theſe are with the fingers; whereof that which ſuſtains the great toe, is the thickeſt and ſhorteſt; and that which ſuſtains the next toe, the longeſt: the reſt grow each ſhorter than other; they are diſtinguiſhed only by the names of the firſt, ſecond, *&c.* and to theſe may be added the two *ſeſamoide* bones.

THE toes, D, make the third part of the foot, and terminate the whole

* Σπῶθ, πέδον, *Planta, planum, veſtigium, ſolum, pectus.*

body. They are five, *a*, *a*, &c. in number, in each foot, called the great toe, the ſecond, third, fourth, and the little toe.

EACH of the toes, except the great one, conſiſts of three *phalanges*, *a*, *b*, *c*, the great toe has but two, whereas the thumb has three, there are five *metatarſal* bones in the foot, and but four *metacarpal* bones in the hand.

THE great toe is thick and big, whereas the other toes are ſmall, in proportion to the fingers.

THE firſt *phalanx* of the great toe, is almoſt like the ſecond of the thumb, but its baſis is more hollow, anſwerable to the convexity of the firſt bone of the *metatarſus*. Its head is in form of a pulley, as in the thumb. The ſecond *phalanx* of the great toe, is like the third of the thumb, but bigger, and broader, eſpecially at the baſis: the tuberoſity, in the ſhape of a horſe-ſhoe, which

which terminates this bone, is more unequal, and more flat than in the thumb.

THE other four toes are very ſmall, when compared with the great one. The firſt *phalanges* are longeſt, but they are ſhorter, and more convex, than thoſe of the fingers. Their bodies are narrow, and contracted in the middle: the baſes are hollow, and the heads are made after the ſame manner, as in the fingers.

THE ſecond *phalanges* are very ſhort, and almoſt out of ſhape: both the heads, and baſes, are mutually articulated with each other. The bodies are of ſome length, in the ſecond and third toes; but they are very ſhort in the other two, eſpecially in the little toe, the body of which is broader than it is long.

THE third *phalanges* are nearly of the ſame figure with thoſe of the fingers, but in proportion much ſhorter

and thicker. In the two laſt toes, they are often united with the ſecond *phalanges*, which perhaps is owing to the continual inaction and compreſſion, occaſioned by the ſhoes.

Plate VIII *OSSA SESAMOIDEA*, the *ſeſamoide* bones, *x*, *y*, *z*, are very ſmall, being denominated from a ſeed, which they are ſuppoſed to reſemble. Several ſuch bones are found in the articulations of the toes and fingers. They are about a third of an inch in length, and half as broad as long; they ſeem only to be ligaments of the articulations or the firm tendons of ſtrong muſcles, or both, become bony, by the violent compreſſion they ſuffer in their ſituation. The *ſeſamoide* bones, at the beginning of the *gaſtroonemii* muſcles, are only compoſed of tendinous fibres: theſe at the firſt joint of the great toe, are plainly of the ſame continued ſubſtance with the ligaments and tendons of the *abductor*, *flexor brevis*, and *adductor*, and that which is often double at the ſecond joint

joint of that toe, is a part of the circular ligament; and were we to obſerve the reſt, we ſhould find them formed in the ſame manner. Their number, figure, ſituation and magnitude, are ſo uncertain, that it would be in vain to inſiſt on the differences of each; we ſhall therefore in general only remark, (1.) That wherever the tendons are firmeſt, the actions of the muſcles ſtrongeſt, and compreſſion greateſt, ſuch bones are moſt likely to be found there. (2.) That, *cæteris paribus*, the older the ſubject is, in which they are ſought, their number will be greater, and ſize bigger. (3.) The more labour or fatigue a perſon undergoes, he will, *cæteris paribus*, have the moſt numerous and largeſt *ſeſamoide* bones.

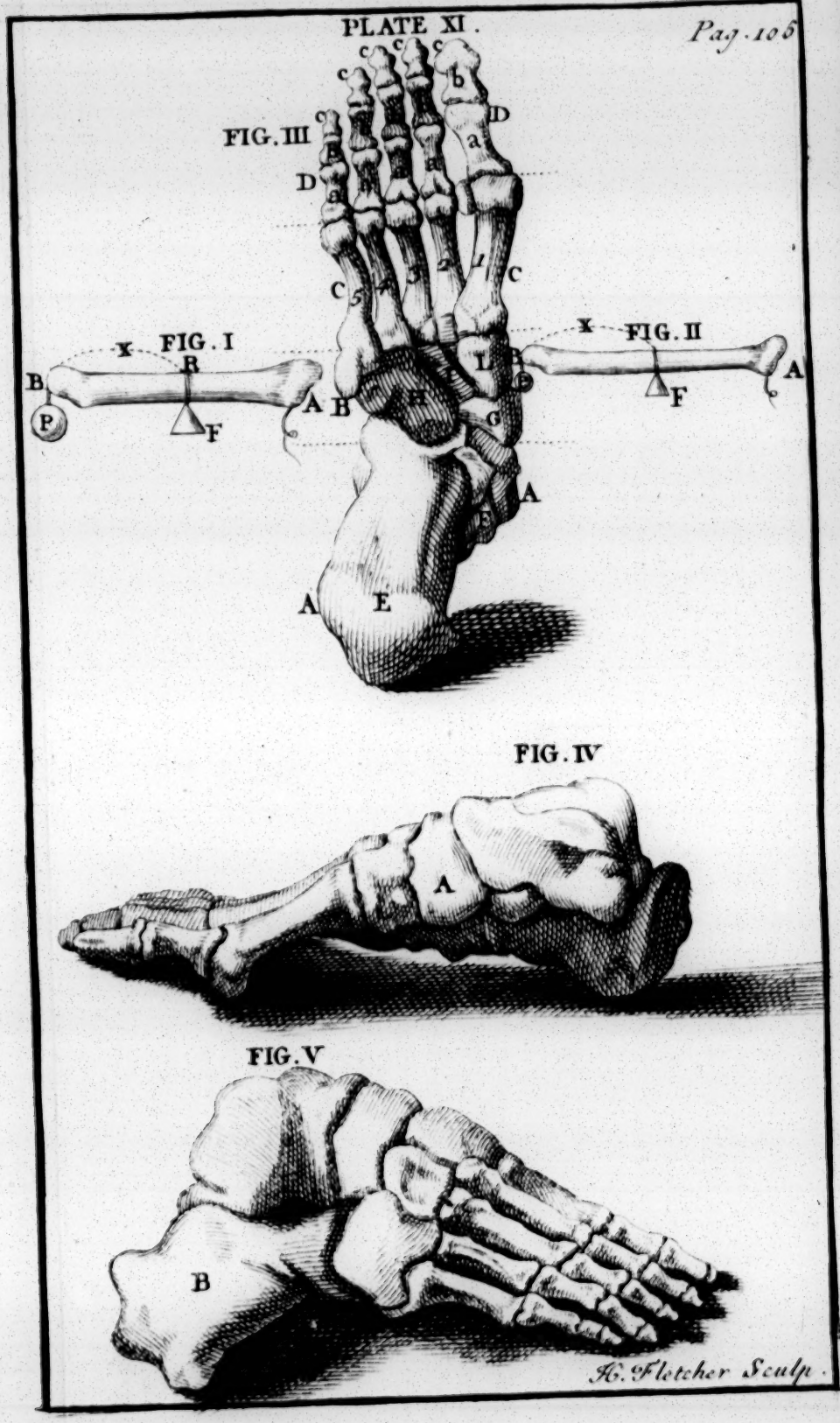
THOUGH the two at the firſt joint of the great toe, are larger than any other, and ſcarce wanting in an adult, we may ſuppoſe, that, beſides the more forcible cauſe of their formation, there ſhould alſo be ſome particular advantage neceſſary

ceſſary at this place, rather than elſewhere, which may poſſibly be, to allow the *flexor* muſcles to ſend their tendons along this joint, ſecure from compreſſion, in the hollow between two oblong *ſeſamoide* bones, while, by removing theſe tendons from the center of motion, and giving them the advantage of an angle at their inſertion, the force of the muſcles is increaſed, and therefore the great ſuperincumbent weight, in proportion, is more eaſily raiſed.

The mechaniſm and uſe of all the bones of the lower extremity.

THE articulation of the *Os femoris*, with the *Os innominatum*, being, by *enarthroſis*, lodged in the *acetabulum*, the thigh can move in all directions. It may be carried forward or backward, nearer or farther from the other thigh, and theſe four motions can be more or leſs oblique, and their number may be multiplied in proportion to the different degrees of obliquity. All theſe motions may be ſo combin'd, as that the lower extremity of the bone ſhall deſcribe

PLATE XI.



deſcribe a kind of circumference, while the head moves only round a center.

THESE motions of the *Os femoris*, are differently limited by the ſtructure of its articulation, and eſpecially by that of the *acetabulum*, and alſo pretty much by the ſituation of the head on the upper extremity of the bone. In ſhort, the depth and obliquity of this articulation, render the mechaniſm thereof very particular, and 'tis of the utmoſt concern to be well acquainted with it, in caſes of luxations and fractures: the following obſervations will, I hope, give an idea of it.

THE thigh ought firmly to ſupport the weight of the body, when we ſtand or kneel, and that in all different changes of ſituation, that is, whether the trunk be ſtreight, inclined, or turned, and even with the addition of a conſiderable load.

THE

THE thigh is moveable in all directions; but the motion of the flexion, whether we ſtand or ſit, is the greateſt of all; that of adduction is alſo conſiderable, eſpecially when the thigh is bent. Theſe two motions are more frequent, and of a greater extent than the reſt; for 'tis by them that the body is carried from place to place, and put in ſeveral neceſſary ſituations, whether in ſtanding, ſitting or lying. Theſe two general diſpoſitions are founded on the depth and obliquity of the articulation. By the firſt, the thigh is able to ſupport the body in all the poſtures we have mentioned; and by the ſecond, the principal motions are made eaſy.

THE *cotyloide* cavity is deeper on the upper and back part, than on the lower and fore part; and it is at theſe two places, or in the middle ſpace between them, that the body is ſuſtained, according as it is in an erect or inclined poſture. The ſtructure of the

the head of the *Os femoris*, is exactly fitted to theſe ſupporting points in the *cotyloide* cavity, its cartilaginous convexity being larger on the upper part than any where elſe. The *cotyloide* cavity is ſhallow on the fore and lower parts, not becauſe theſe parts are leſs neceſſary for ſupporting the body, but a proviſion is thus made for the obliquity of the articulation, without which the thigh could not but with great difficulty have been bent, or carried inward, or over the other thigh. The obliquity of the *cotyloide* cavity, facilitates the motion of adduction, and the obliquity of the head of the *Os femoris* facilitates and enlarges the motion of flexion.

In the motion of abduction, a part of the head of the bone goes out of the cavity, and that in two different ways. When we ſtand, or lie at full length, and in theſe poſtures ſeparate the thighs from each other, the head goes out at the lower end of the cavity;

vity; but when we ſit, or lie on our backs, with the thighs raiſed, and ſeparate the thighs, it goes out on the fore part.

THE motion called *rotation*, varies in proportion as the thigh is extended or bent. The rotation of the thigh, when extended, brings the head of the *Os femoris* either forward or backward. When the head is carried backward, the neck ſtrikes againſt the hind edge of the *acetabulum*, or *cotyloide* cavity, and a large part of the head goes out at the fore part of the cavity; but when the head is carried forward, a ſmall part of it goes out of the cavity, becauſe of the depth of the edge at the back part; and the neck ſtrikes not againſt the fore edge, which is very low. In the rotation of the thigh, when bent, the head is brought upward and downward, and goes leſs out of the cavity above than below.

THE

THE articulation of the *tibia* with the *Os femoris*, is of a very ſingular nature. In the flexion and extenſion of the *tibia*, it is a *ginglymus*; but there is ſtill ſomething more in it, whereby the leg is capable of having a rotation independent of that of the thigh. This we plainly ſee, when ſitting, and preſſing the heel againſt the ground, we turn the toes alternately outward and inward: we then obſerve that the whole leg makes reciprocal half-turns independent of the thigh; and if we put our hand upon the knee, and then graſp the joint with our fingers, we feel the head of the *tibia* in the ſame manner, while the extremity of the *Os femoris* is at reſt. And if we carefully examine, we ſhall find that the center of this motion is rather in the inner cavity of the head of the *tibia*, than in the middle ſpace between the two cavities; for we plainly feel that the external head of the *tibia* moves backward and forward, while the internal turns almoſt wholly

ly round its axis. We may therefore diſtinguiſh three ſorts of motion in this joint, that of *flexion* and *extenſion*, the rotation of the internal part of the head of the *tibia* on an axis, and a kind of *arthrodial* motion of the external part of the ſame head.

WE take the *patella* to belong as properly to the *tibia*, as the *olecranon* to the *ulna*; becauſe it is of the ſame uſes with reſpect to that bone, as the *olecranon* is to the other. They both ſerve to facilitate the action of the extenſor muſcles, by placing their direction at a greater diſtance from the center of motion of the joint. They both ſerve to defend the tendons of theſe muſcles from the compreſſions, contuſions and ruptures, which they would be ſubject to in great efforts, did they paſs over the ſharp edges of the bones; and, laſtly, they ſecure theſe tendons from the like accidents when the joints ſtrike againſt or preſs upon any hard body, as when we lean on

the

the elbow, or kneel; or when the elbow or knee receives any external injury from ſtrokes, *&c.*

THE difference between the *patella* and *olecranon* is, that the one is immoveable, making but one piece with the *ulna*; the other moveable, being a diſtinct piece from the *tibia*. The immobility of the *olecranon* ſtrengthens and ſecures the articulation of the *ulna* with the *Os humeri*, which is deſigned only for flexion and extenſion. For the ſame reaſon the *patella* would have been immoveable, had the articulation of the *tibia* with the *Os femoris* been contrived for theſe two motions alone; and eſpecially becauſe the extenſor muſcles of the *tibia* are often expoſed to greater efforts, in ſupporting the weight of almoſt the whole body, ſometimes increaſed by that of a conſiderable burden.

THE rotation of the leg, when bent, is the only cauſe of this difference,

 becauſe

becauſe, had the *patella* been immoveably joined to the *tibia*, the leg could never have made theſe half turns, without either a luxation, or a fracture of the *patella*. We may therefore look upon the *olecranon* as an immoveable *patella*, and the *patella* as a moveable *olecranon*.

THE *fibula* is articulated, by its upper extremity, with the lower ſurface of the external *condyle* of the head of the *tibia*. This is an obſcure *arthrodia*, and ſuffers the head of the *fibula* to ſlide only a little forward and backward; the deſign of which ſmall degree of motion ſeems to be, that the *fibula*, wherein many muſcles of the foot are inſerted, may yield a little in the violent efforts of theſe muſcles, as in running much, jumping, or walking under a heavy burden.

THIS bone is alſo joined to the *tibia* by its lower extremity, and makes the

the outer ankle. But this connexion is ligamentary. The upper edge of the cartilaginous ſurface of this extremity is articulated, at the lower part of the lateral depreſſion of the *tibia*, with a narrow cartilaginous border, which is the thick edge of the cartilage at the baſis of that bone. The cartilaginous ſide of the external ankle compleats the cavity, whereby the leg is joined to the foot, and contributes more to that than the internal ankle.

THE *fibula* is not ſituate directly on the outſide of the *tibia*, but a little more backward; ſo that having placed the two legs of a ſkeleton in their natural erect poſture, a pretty thick rod might paſs between the two *tibiæ* and *fibulæ*, without changing the ſituation of the legs.

THE foot is articulated with the leg by the *aſtralagus* alone, and this articulation is an angular *ginglymus*, in-

tirely confined to the motions of flexion and extenſion.

THE articulation of the *aſtragalus* with the ſeveral ſurfaces of the *Os calcis* is an obſcure *arthrodia*, as thoſe of the other bones of the *tarſus* are with each other. By theſe articulations, the foot not being ſupported, makes ſmall lateral motions; but when the toes are turned outward or inward, independently of the *tibia*, the *Os calcis* makes ſmall half-rotations under the *aſtragalus*, and obliges the *Os ſcaphoides* to ſlide in the ſame direction with it on the outer ſide of the *aſtragalus*; and this motion of theſe two bones is communicated to all the reſt.

IT is by the articulation of the *Os ſcaphoides* with the *aſtragalus*, that the ſmall lateral flexions of the foot are performed, *viz.* when the ſole of one foot is turned toward the other, or the contrary way. In this caſe the *Os ſcaphoides* makes ſmall rotations on the

the upper ſide of the *aſtragalus*, while the *Os cuboides* ſlides up and down on the fore ſide of the great apophyſis of the *Os calcis*. The obliquity of the articular ſurfaces of theſe two bones is perfectly ſuitable to ſuch a motion. In theſe motions the *Os calcis* and *aſtragalus* are in a manner immoveable, but the other bones are carried along with the *Os ſcaphoides*. The articulation of the *Os ſcaphoides* and *cuboides*, with the three *Oſſa cuneiformia*, that of the four laſt mentioned bones with thoſe of the *metatarſus*, and that of the *metatarſal* bones with each other, allow of an obſcure motion, by which we can bend or contract the foot in proportion to its length, and a little according to its breadth.

All theſe motions of the bones of the *tarſus* and *metatarſus* are pretty ſenſible in children, and the loſs of them is often owing to the manner of wearing ſhoes, which loſs is moſt frequent in the ſmall bones of the *tarſus*, and

thoſe of the *metatarſus*. Womens high-heel'd ſhoes change entirely the natural ſtate of theſe bones, cauſing in them the ſame ſort of diſorder we obſerve in the *vertebræ* of crooked perſons. Thoſe who do not wear ſtrait ſhoes may preſerve theſe motions to an advanced age.

THE articulation of the firſt *phalanges* of the toes with thoſe of the *metatarſus* is ſpheroidal, and allows motions in different directions. The articulation of the *phalanges* with each other is by *ginglymus*. In the natural ſtate theſe motions are free and eaſy, and they are impaired by the bad manner of wearing ſhoes; and it is for the ſame reaſon that the *phalanges* of the little toe often grow together.

SECT.

SECT. VII.

Of the MARKS *of a* Female SKELETON.

THE fair ſex have a fine and delicate conſtitution, and are obliged to afford lodging and nouriſhment to their tender *Fœtus*'s, till they have ſtrength to endure the injuries of the atmoſphere, and the contact of other more ſolid ſubſtances; therefore the bones of women are often incomplete, and always of a make, in ſome parts of the body, different from thoſe of the robuſt male.

THE cauſes of the following particulars of the female bones may be reduced to theſe three, (1.) A weak and lax conſtitution; (2.) A ſedentary and inactive

life, encreaſing the former; (3.) A proper frame for being mothers.

THE bones of women are ſmaller in proportion to their length, than thoſe of men, becauſe the force of their muſcles is not ſo great, nor is ſo ſtrong an external force applied to them.

THE depreſſions, ridges, ſcabrous ſurfaces, and other inequalities made by the muſcles, are not ſo conſpicuous in them, for the ſame reaſon as the former *phænomenon.*

THEIR *Os frontis* is more often divided by a continuation of the *ſagittal* ſuture, which depends on the ſecond general cauſe aſſigned.

THEIR *clavicles* are leſs crooked, becauſe their arms are not pulled forward with ſo great a force, which in our *European* women is more hindred by their dreſs.

THEIR

THEIR *ſternum* is more raiſed by long cartilages below, that the *thorax* might there be widened, in proportion to what it is ſhortned by the preſſure on the *diaphragm*, when they are with child.

SOME ſay, that the defect of the bone, or hole in the middle of the *ſternum*, is more often found in them, to allow the paſſage of the mammary veſſels; but this is owing to the firſt general cauſe; for a ſmaller hole would have ſerved the intention; and the internal mammary veſſels furniſh the ſmaller ſhare of liquids that are convey'd to the breaſts.

THE *cartilago xiphoides* is more often bifurcated in women than men, on the preceding account.

THE upper cartilages of the ribs ſooner oſſify, to ſupport the weight of the *mammæ*.

THE

THE middle cartilages are more flat and broad, by the weight of the breasts.

The lower cartilages are longer, for enlarging the chest.

THE *Os sacrum* is more turned outward, for enlarging the *pelvis*.

THE *Os coccygis* is more moveable, and less bended forward, to facilitate the birth.

THE *Ossa ilium* are more reflected outward, and consequently farther from each other, to widen the lower part of their *abdomen*.

SECT.

SECT. VIII.

Of the Number of the BONES *in a human Body.*

THE head is divided into two general parts. The firſt is a bony cavity called the ſkull; the other conſiſts of ſeveral pieces, which form the greateſt part of the face, tho' ſome part of the ſkull contributes thereto.

THE ſkull conſiſts of eight bones, *viz.* the *Os frontis*, the forehead bone; *Os occipitis*, the occipital bone; *Oſſa parietalia*, the ſincipital or parietal bones; *Oſſa temporum*, the temporal bones; *Os ſphenoidale*, the ſphenoidal bone; and *Os ethmoides*, or *cribroſum*, the ethmoidal bone.

BE-

BESIDES theſe, anatomiſts often meet with ſupernumerary bones, the ſize and number of which vary conſiderably.

THE upper jaw contains two large bones called *Oſſa maxillaria*, from the word, *maxilla*, by which this part of the face is expreſſed; the two *Oſſa malæ*; the two *Oſſa unguis* or *lachrymalia*; the two *Oſſa naſi*; the two *Oſſa palati*; the two *Oſſa convoluta*, or lower ſhells of the noſe; and one bone named *vomer*. All theſe amount to thirteen, without reckoning the teeth which are commonly ſixteen.

THE lower jaw has but one bone, and as many teeth as the upper.

THE trunk is divided into three parts; one common, called the *ſpine*; and two proper, *viz.* the *thorax*, or *breaſt*, and the *pelvis*.

THE

THE *ſpine* is compoſed of twenty four pieces called *vertebræ*, ſeven of which belong to the neck, twelve to the back, and five to the loins; and, ſecondly, of the bone termed *Os ſacrum*, with its appendix, named *Os coccygis* or *coccyx*.

THE *Thorax* is chiefly made up of the ribs and *ſternum*. There are on each ſide twelve ribs, fixed by their poſterior ends to the *vertebræ* of the back, the remaining parts of the *thorax*. The uppermoſt ſeven are called the true ribs, and the five loweſt, falſe ribs.

THE *Sternum* conſiſts of two or three pieces, lying between the fore ends of the true ribs.

THE *Pelvis* is chiefly formed by two great bones called *Oſſa innominata*, joined before to each other, and behind to the *Os ſacrum*, which compleats the *pelvis*.

THE extremities of a ſkeleton are four, two upper, one on each ſide of the *thorax*, and two lower, joined to the ſides of the *pelvis*.

EACH upper extremity is divided into the ſhoulder, arm, fore-arm, and hand.

THE ſhoulder is made up of two pieces, one before called *Clavicula*, and one behind *ſcapula*. The arm is only one bone, termed *Os humeri*. The fore-arm has two, the *ulna* and *radius*. The hand is divided into three parts; the *carpus* or *wriſt* conſiſting of eight bones; the *metacarpus*, which is made up of four; and five fingers, each of which contains three bones called *phalanges*.

EACH lower extremity is divided into the thigh, leg, and foot.

THE thigh has but one bone, termed *femur* or *Os femoris*.

THE

THE leg is made up of two large bones, named *tibia* and *fibula*, and of one ſmall bone called *patella*.

THE foot is divided into three parts, the *tarſus*, which is made up of the ſeven following bones, *viz.* the *Os calcis*, *aſtragalus*, *Os naviculare*, *Os cuboides* or *quadratum*, and the three *Oſſa cuneiformia*; the *metatarſus* is made up of five bones, and the toes, which are five, the greateſt conſiſting of two bones, and the other four of three bones each, called *phalanges*, as thoſe of the fingers.

THERE are, beſides theſe, ſome ſmall bones, which are rarely met with in a ſkeleton, *viz.* the *Os hyoides* or bone of the tongue, the eight *Officula auditus*, or bones of the ear, four lying in each temporal bone, the little bones ſometimes found at the extremities of the *apophyſes petroſæ* towards the *ſella turcica*, and the *ſeſamoidal* bones of the fingers and toes; of which thoſe belonging to the

the great toe are conſiderable enough to be commonly preſerved in ſkeletons.

WE ſhall not here mention a kind of *ſeſamoidal* bones, ſometimes found on the *condyles* of the *femur*, at the lower end of the *fibula*, at the *Os calcis*, and at the *Os cuboides*.

AFTER this enumeration of the bones of the ſkeleton, we may eaſily determine their number: to the head belong fifty four, without reckoning the *Os hyoides*, or the bones of the ear; to the trunk fifty four, taking the *coccyx* for one bone, and the *ſternum* for two; and to the extremities, a hundred and twenty four, leaving out the *ſeſamoidal* bones: ſo that the whole number is two hundred and thirty two; to which, if we add the eight bones of the ear, and the five principal pieces of the *Os hyoides*, we ſhall have in all two hundred and forty five, the *ſeſamoidal* bones being ſtill left out.

Ex-

Explanation *of* Plates XII. *and* XIII.

IN the two following plates, we have the whole contexture of the BONES, *called a* Skeleton; *whereby we ſee how they are connected with each other. Plate* XII. *gives a fore view, and Plate* XIII. *a ſide and hind view.*

N. B. *Fig.* 1. *betwixt the letter and the word, directs to Plate* XII. *Fig.* 2. *to Plate* XIII. *and Fig.* 1, 2. *to both Plates.*

Æ 2 *Cranium.*
a 1 *Os frontis.*
b 2 *Os ſincipitis.*
c 2 *Os occipitis.*
d 1 2 *Oſſa temporum.*
e 2 *Meatus auditorius.*
f 2 *Proceſſus mammillaris.*
g 2 *Vertex.*
h 2 *Sutura ſagittalis.*

1 2 *Sutura lambdoidalis.*
k 2 *Sutura ſquamiformis.*
m 2 *Proceſſus aliformis.*
n 1 *Os jugale.*
o 1 Orbits of the eyes.
p 1 Two bones of the noſe.
q 1 *Maxilla* ſuperior.
r 1 *Maxilla* inferior.
ſ 1 Teeth.
t u 1 2 *Vertebræ* of the neck.
u x 1 2 *Vertebræ* of the back.
x y 1 2 *Vertebræ* of the loins.
y z 2 *Os ſacrum.*
α 2 *Os coccygis.*
β 1 *Os pectoris.*
γ 1 *Cartilago enſiformis.*
♂ ♂ 1 *Claviculæ.*
ζ ζ 1 Spine of the *claviculæ.*
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 1 2 Ribs.
θ θ 2 *Scapulæ* in a ſide and hind view.
μ μ 1 2 *Oſſa innominata,* in a fore, ſide, and hind view.
ν ν 1 2 *Os coxendicis.*
ξ ξ 1 2 *Os pubis.*

οο 1 2 Spine of the *Os ilium.*

π 2 *Acetabulum coxendicis.*

υυ 1 The great ſinueſſes of the *Oſſa ilium* and circumſcription of the *Pelvis abdominis.*

ττ 1 The foramen of the *Iſchium* and *Os pubis.*

A 1 2 *Os humeri.*

B 1 2 *Sinus ſcapulæ.*

C 1 2 *Caput oſſis humeri.*

D 2 *Cubitus.*

E 1 2 That proceſs to which the *radius* is articulated.

FG 1 2 The two protuberances of the *Os humeri.*

H 1 2 *Cubitus.*

I 1 2 *Radius.*

KK 1 2 *Carpus.*

L L 1 *Metacarpus.*

M M 1 The fingers.

N 1 2 *Os femoris.*

O 1 2 The neck of the *femur.*

P 1 2 *Acetabulum coxendicis.*

QQ 1 2 The external protuberances of the *Os femoris.*

R 1 2 The leſſer *trochanters* of the *femur.*

S 1 2 The greater *trochanters* of the *femur.*

T 1 *Patella.*

V 1 2 *Tibia.*

X 1 2 *Fibula.*

Y 1 2 *Talus.*

Z 2 *Os calcis.*

Γ 1 2 *Os naviculare.*

Δ 1 2 *Os cubiforme.*

ΘΛΞ 1 2 *Oſſa cuneiformia.*

Σ 1 2 *Metatarſus.*

ΦΦ 1 2 The fourteen toes.

SECT.

PLATE XII

Pag. 132

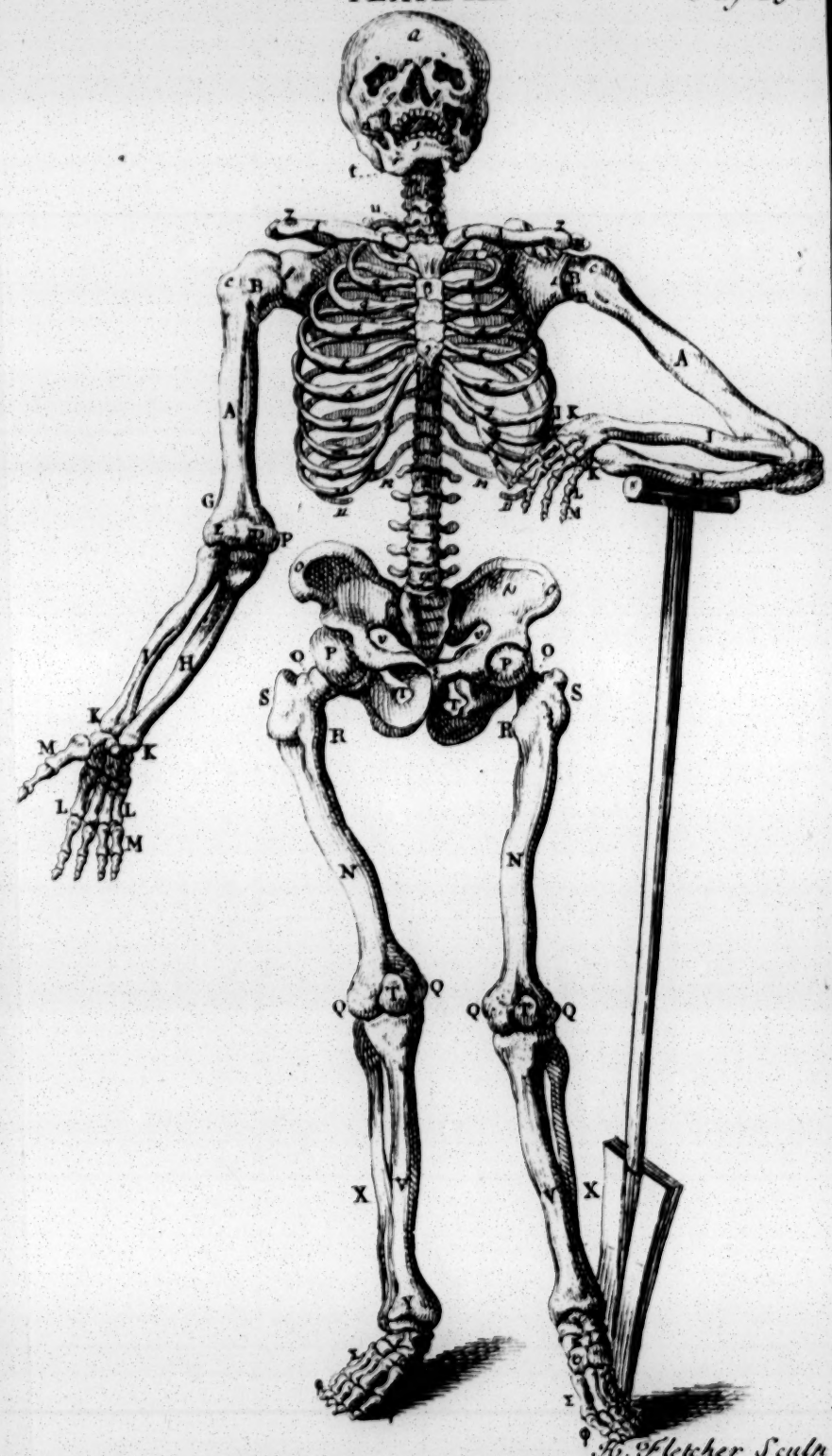
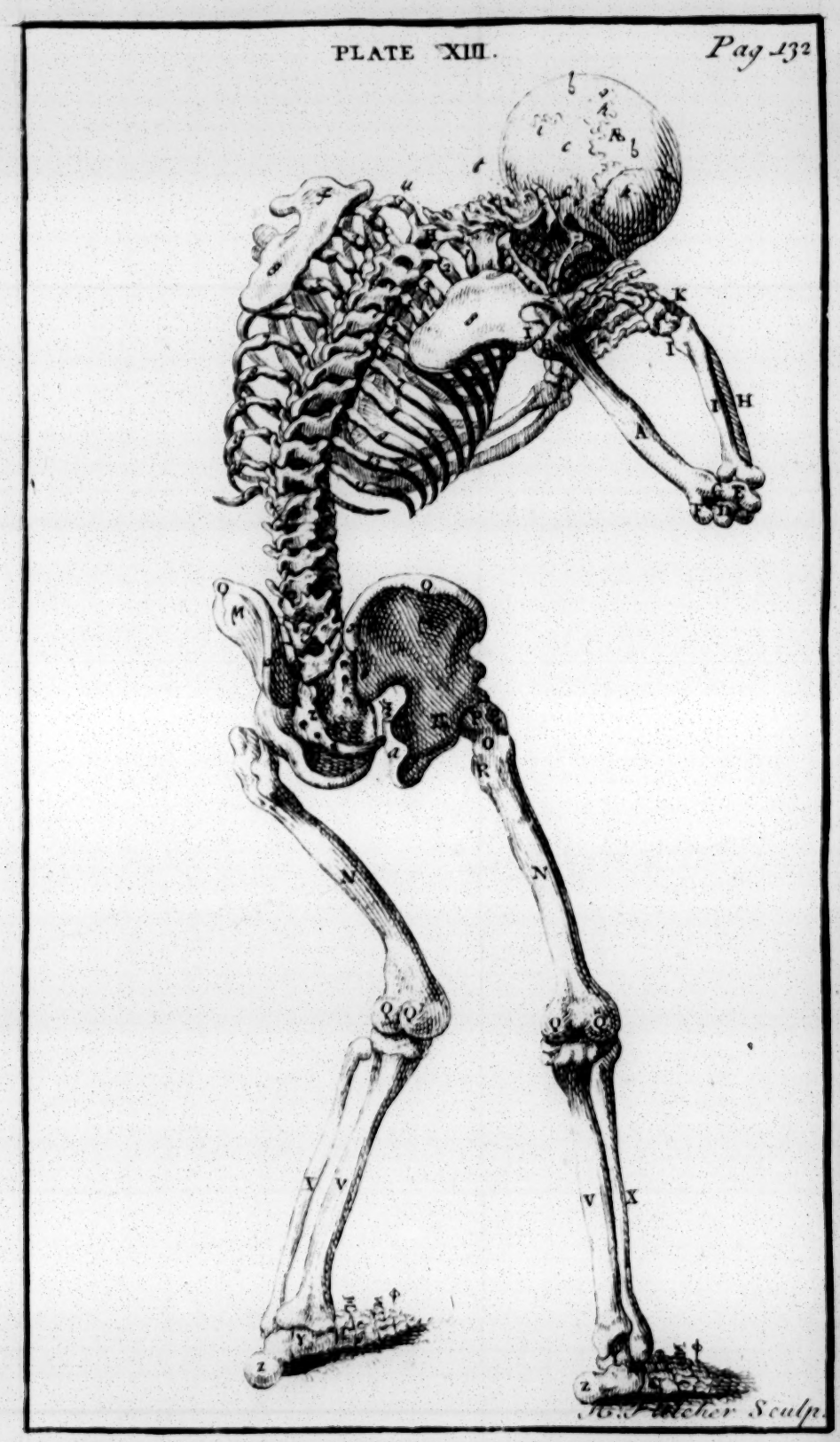


PLATE XIII. Pag 132



N. J. Fletcher Sculp.

SECT. IX.

Of Muſcular MOTION.

HAVING ſhewn but a little of the wiſdom of God in the ſituation, figure, connexion and uſes of the bones, the beams and pillars of our fabric; can we yet forbear his contrivance in the muſcles, which are in number * above four

K 3

* Anatomiſts are not yet agreed on the number of muſcles in the human body; ſome reckon 529; ſome 446; and others only 435: the *calculus* according to theſe laſt is as follows.

Two of the fore-head, two of the *occiput*, ſix of the eye-lids; twelve of the eyes, ſeven of the noſe, eight of the external ear, thirteen of the lips, eight of the tongue, four of the palate, fourteen of the *larynx*, ſeven of the *pharynx*, ten of the *Os hyoides*, twelve of the under jaw, fourteen of the head, eight of the neck, eight of the *omoplates*, eighteen of the arms, twelve of the elbows, eight of the *radii*, twelve of the *carpi*, forty eight of the fingers, fifty ſeven of uſe in reſpiration, ſix of the loins, ten

four hundred, whereby the body can put itſelf in any poſture, and move either upward or downward, to the right or left, before or behind? Again, as the muſcles adhere to the bones, they acquire a particular figure or ſhape, and are either two-headed, three-headed, two-horned, or the like.

A MUSCLE is compoſed of a red and white part. The red is its fleſhy, and the white its tendinous part. Some muſcles are tendinous both at their origin and inſertion, and fleſhy only in their middle; and others are fleſhy in their origin and middle, and tendinous only at their inſertion. The fleſhy part of a muſcle is compoſed of fibres, membranes, nerves, blood-veſſels, and lympheducts. The fibres are ſmall threads, ſhortened when a muſcle is contracted, and lengthened when dilated.

ten of the *abdomen*, two of the teſticles, one of the bladder, four of the *penis*, four of the *anus*, thirty of the thighs, twenty two of the legs, eighteen of the feet, forty four of the toes.

ed. The membranes are thin ſkins, running between the fibres, are faſtened to them, and tie them together. If a piece of fleſh is boiled, till tender, and afterward divided and ſubdivided, as far as the eye and hand can go; it will appear, that each minute fibre, in the loweſt ſubdiviſion, is ſurrounded by its own particular membrane. The membranes, if they be extremely thin, are tranſparent; and if thick, of a whitiſh colour. The nerves are diſperſed throughout the whole fleſhy part; as is plain from the pain, which is produced any where in that part, by the ſmalleſt wound. It has been a received opinion, that the nerves are ſmall pipes, which contain a fluid, called animal ſpirits, drawn off from the blood in the brain. But it appears not from experiments, that the nerves are pipes; or that ſuch a fluid, as they conceive animal ſpirits to be, is ſeparated from the blood in the brain; therefore theſe opinions have no foundation. The nerves are not only impervious to the ſmalleſt *ſtylus*,

but, when viewed with a microſcope, evidently appear to have no cavity. And when we conſider the manner, in which the favourers of this opinion have explained muſcular motion by animal ſpirits; we muſt allow, that ſuch a fluid is entirely unfit for this work. For theſe reaſons, many have thought the nerves to be ſolid threads, extended from the brain to the muſcles and other parts of the body. Sir *Iſaac Newton* is of opinion *, *That the* capillamenta *of the nerves are each of them ſolid and uniform; that the vibrating motion of the ætherial medium may be propagated along them, from one end to the other uniformly, and without interruption: for obſtructions in the nerves create palſies. And that they may be ſufficiently uniform, I ſuppoſe them to be pellucid when viewed ſingly, tho' the reflections in their cylindrical ſurfaces may make the whole nerve, compoſed of many* capillamenta, *appear opake and white. For opacity ariſes from reflecting ſurfaces, ſuch as may diſturb and interrupt the motions of this medium.*

The

* *See* 24th Query of his Optics.

The blood veſſels of a muſcle are interwoven in the membranes, and diſtributed throughout its whole fleſhy part; as appears from its redneſs, and from the iſſuing out of blood from a puncture any where made with the fineſt needle. The muſcles are ſtocked with lymphatic veſſels, as well as the other parts of the body.

HAVING thus far conſidered the ſtructure of a muſcle, we ſhall now attempt the proof of muſcular motion, taken from the learned Dr. *Bryan Robinſon*, that when a muſcle is contracted, its fleſhy fibres are ſhortened and hardened, without a ſenſible change made in its tendons; that as ſoon as the contraction is over, or the contracting force ceaſes to act, the ſhortened and hardened fibres are again lengthened and ſoftened; that this alternate motion of contraction and dilation continues in the hearts of ſome animals, eſpecially young ones, for a conſiderable time, after they are cut out of their bodies,

bodies, and laid on a table; that it generally continues longer in the hearts of fiſh, than in the hearts of land-animals; and after it is ceaſed, it will be again renewed by warmth, or the pricking of a pin, and will continue to be excited by either, eſpecially warmth, for ſome little time, till the heart wholly loſes its power of moving; that as the heart cools by degrees, ſo its motion gradually abates, its contractions and dilations growing leſs and leſs frequent and ſtrong, till at laſt they wholly ceaſe; and that the heat of the heart is greater, and its motion more frequent and ſtrong, in an ardent fever, and the hot fit of an ague, than in its natural ſtate.

HENCE the heat is a remote cauſe, both of the frequency and ſtrength of the motion of the heart; and conſequently, one of the remote cauſes of the motion of a muſcle.

WE find, that, by the power of the will, we can move the muſcles of our limbs

limbs with different degrees of force; that there is not the leaſt ſenſible difference, in point of time, between willing the motions of the muſcles, and the motions themſelves; that muſcles contracted by the power of the will, dilate again, the inſtant, in which the ſoul ceaſes to exerciſe that power; and that the ſoul loſes that power of moving the muſcles, and perceiving pain from wounds made in the fleſhy parts, when their nerves are cut quite thro', tied ſtreight, or any other way obſtructed.

Hence, the nerves are the inſtruments whereby the the will gives motion to the muſcles: and this is done by producing ſome kind of motion in thoſe ends of the nerves which terminate in the brain, which motion is propagated from thence thro' their ſolid, pellucid and uniform *capillamenta* into the muſcles. For if the nerves were entirely at reſt, and no motion was propagated through them, they could never, by the power of the will, or any other cauſe, produce motion in the muſcles.

On laying bare the great muſcle of the hinder leg of a dog, and the great nerve which accompanies the crural artery and vein; we have ſeen, that when the tendon was wounded, the dog ſhewed very little uneaſineſs; but expreſſed great pain, on wounding the fleſhy part of the muſcle; and a greater pain, on wounding, or in the inſtant of tying the nerve; that a contraction of the muſcle was produced, on wounding its fleſhy part; and a ſtronger contraction on wounding, or in the inſtant of tying the nerve; and that after the nerve was cut quite through or tied ſtrait, great uneaſineſs and pain with moſt violent ſtruggles were produced, as often as a new wound was inflicted, or a new ligature made, above the laſt ſection or ligature, in that part of the nerve which communicated with the brain; but neither pain nor contraction of the muſcle followed, on wounding or tying that part of it which communicated with the muſcle and limb. And we have likewiſe obſerved on trepanning

ning dogs, and wounding ſeveral parts of their brains, that convulſive motions of the limbs have ever been produced, on wounding the *medulla oblongata*, but never on wounding the *dura mater*, or cortical part.

Hence alſo the nerves are the principal inſtruments of ſenſation and motion; theſe effects are ſtronger or weaker, as more or fewer of the nervous *capillamenta* are tied or wounded; theſe effects are the ſame, in whatever part of a nerve the ſection or ligature is made; and the ſoul perceives pain, and exerts its power of producing muſcular motion, only at the origin of the nerves in the brain.

The exceeding quickneſs of this motion, paſſing from the brain through the *capillamenta* of the nerves, to the moſt diſtant muſcles in an inſtant, and its ceſſation the very moment the cauſe which produced it ceaſes to act, ſhew it to be the vibrating motion of a very elaſtic

elaſtic fluid. For it is the nature of the vibrating motion of an elaſtic fluid to be very ſwift, and to ceaſe the inſtant, the cauſe which produced it ceaſes to act. A vibrating motion excited in the air by the tremors of bodies for the production of ſounds, moves at the rate of 1142 *Engliſh* feet in a ſecond of time, and ceaſes the inſtant in which the tremors of the bodies ceaſe.

NOW, ſince this motion, begun in the nerves at their origin, has been proved to be the vibrating motion of a very elaſtic fluid; and ſince the other phænomena of nature abſolutely require ſuch an elaſtic fluid, as is the æther deſcribed by Sir *Iſaac Newton*; and ſince cauſes are not to be multiplied without neceſſity: therefore it muſt be allowed, that this motion begun in the nerves at their origin, is the vibrating motion of the æther; the properties of which, gathered from the phænomena, are theſe which follow.

THIS æther is exceedingly more rare and ſubtil than air, and exceedingly more elaſtic and active. It readily pervades all bodies, and by its elaſtic force is expanded through all the heavens. If it be 700000 *times more elaſtic than our air, it is above* 700000 *more rare. Its elaſtic force in proportion to its denſity, is abbove* 490000000000 *times greater than the elaſtic force of the air is, in proportion to its denſity. It is rarer within bodies, than in the empty ſpaces between them; and in paſſing from bodies into empty ſpaces, it grows denſer and denſer by degrees; and the increaſe of its denſity, at any diſtance from the center of gravity of a body, is as the quantity of matter in the body directly, and the ſquare of that diſtance inverſely: and it is rarer within denſe bodies, than within rare bodies. All bodies endeavour to recede and go from the denſer parts of it, toward the rarer; and the force wherewith a body endeavours to recede, is as the quantity of matter in the body, and the increaſe of the denſity of the æther at the centre of gravity of*

the

the body, taken together. When it is put into a vibrating motion by the rays of light, the will of animals or other cauſes, its vibrations or pulſes move ſwifter than light, and, by conſequence, above 700000 times ſwifter than ſounds. Its denſity and expanſive force, are both increaſed in proportion to the ſtrength and vigour of its vibrating motion; which motion, like the vibrating motion of the air for the production of ſounds, grows weaker, as the ſquare of the diſtance from the place in which it is excited increaſes. And, laſtly, *its vibrating motion is regularly propagated thro' bodies made of uniform denſe matter, but is reflected, refracted, interrupted or diſordered by any unevenneſs in the bodies.*

THESE are the principal properties, with which this æther muſt neceſſarily be endued; which we thought fit to mention, before we ſhewed the manner in which it cauſes the motion of the muſcles.

WHEN

When by the power of the will a vibrating motion is excited in the æther, in thoſe ends of the nerves which terminate in the brain, that motion is inſtantly propagated through their ſolid and uniform *capillamenta* to the membranes of the muſcles, and excites a like motion in the æther lodged within thoſe membranes; and a vibrating motion raiſed in the æther within the membranes, increaſes its expanſive force; an increaſe of that force ſwells the membranes; a ſwelling of the membranes cauſes a contraction of the fleſhy fibres; and that contraction, a motion in the parts to which the extremities of the muſcles are faſtened. Thus the limbs and other parts of animals are moved by their muſcles, each of which has its two ends faſtened to two bones, whereof one is more moveable than the other; on which account when its fleſhy fibres are ſhortened by the ſwelling of the membranes, the more moveable bone is drawn to that which is more fix'd, by means of an intervening joint on which it turns.

WHEN the will ceaſes to act, the vibrating motion of the æther cauſed by that action ceaſes; in like manner as the pulſes of the air cauſing ſounds ceaſe, on a ceſſation of the tremors of ſonorous bodies, by which they are excited; and a ceſſation of the vibrating motion of the æther, cauſes a diminution of its expanſive force; and a diminution of that force, gives an opportunity to the dilated membranes to contract, by the attractive powers of their parts, and thereby to lengthen the fleſhy fibres. Another cauſe of the lengthening of the fleſhy fibres, and dilatation of a muſcle, is a vibrating motion, excited in the æther lodged in the fleſhy fibres by their contraction: for that vibrating motion will increaſe the expanſive force of the æther, and that increaſed force will lengthen the fibres, the inſtant the cauſe which contracted them ceaſes to act. Theſe two forces added together, make the whole force whereby a contracted muſcle is dilated: for the experiments abovementioned fully prove, that the

ſoul

ſoul has no immediate power over the fleſhy fibres. Thus the muſcles of animals are moved by the æther when put in a vibrating motion by the power of the will.

Having ſhewn that heat, punctures or wounds, and ligatures on the nerves, in the inſtant they are made, have a power of contracting the muſcles: and from the effects of vomiting and purging medicines, and ſome poiſons, we learn, that the ſubtil and active particles of ſome bodies have a like power: but ſince all theſe things, however different they are in themſelves, do produce the ſame effect which the will does, they muſt do it in the ſame manner, that is, by exciting a vibrating motion in the æther within the nerves and membranes of the muſcles.

Hence, 1. The motion of the muſcles becomes weak, either from too weak a vibrating motion of the æther in their membranes and fibres; or an

unfitneſs in the membranes and fibres to be moved with vigour by a due degree of that vibrating motion. The vibrating motion excited by a given force becomes weak, when the æther becomes rare; and the æther becomes rare, when the membranes and fibres become denſe, from moiſture ſoaking into their pores, from compreſſion, or other cauſes. And the membranes and fibres become unfit to be moved with vigour, when they are rendered ſtiff by age, too hard labour, or other cauſes.

2. Muscles grow larger and ſtronger by moderate exerciſe: for the expanſive force of the æther muſt be increaſed, before it can move the muſcles; and a frequent increaſe of this force in muſcles much moved, muſt of neceſſity increaſe both their magnitudes and ſtrengths. Hence labouring people have larger and ſtronger muſcles, than thoſe who lead a ſedentary and inactive life.

3. The

3. The blood moving through a muſcle, is preſſed forward by the force of its contraction; but after a muſcle is contracted, if it be kept in that ſtate by the conſtant action of the force which contracted it, leſs blood will flow through it in a given time than did before: for the blood veſſels interwoven in the membranes, are compreſſed and contracted by the ſwoln membranes, and ſhortened and hardened fibres: and this contraction of the veſſels, while it is exerting, preſſes the blood forward; but afterward hinders the blood from flowing through the muſcle in that quantity it did before. Hence exerciſe performed by the motion of the muſcles, accelerates the motion of the blood; and cramps and other permanent convulſions retard it.

4. The magnitude of a muſcle may be but little altered by its contraction: for if the contraction of the fleſhly fibres be nearly equal to the ſwelling of the membranes, its magni-

tude will continue much the ſame, though its figure be changed.

5. The forces of correſponding muſcles in healthful bodies, are meaſured by their weights, and the ſtrengths of the vibrating motions of the æther in them, taken together.

6. If a great increaſe of the vibrating motion of the æther in the nerves and membranes of one part of the body be, from ſome cauſe, attended with a diminution of its vibrating motion in the nerves and membranes of other parts; then it may be in the power of art to quiet a diſturbance in one part, by raiſing a ſtronger diſturbance in another: as by bliſters, cauteries, and other powerfully ſtimulating bodies, applied to one part of a human body, we often relieve pain, and quiet convulſive motions in other parts of it.

SECT.

SECT. X.

Of the MOTION *of the* BLOOD.

THE blood moves in the arteries and veins with a kind of circular motion.

DR. *Harvey* has proved this from experiments and obſervations: for he has ſhewn, that the blood flows out of the trunk of the *vena cava*, into the right auricle of the heart; out of that, into the right ventricle; thence, through the lungs, into the left auricle and ventricle; out of the left ventricle, into the *aorta*; whoſe branches convey it to all parts of the body, except the lungs, and pour it into the ſmalleſt branches of the veins; out of which it paſſes into branches ſtill larger, till

at laſt, by the *vena cava* it is brought back to the heart. And this motion of the blood, from and to the heart, is called its *circulation*, or *circular motion.*

THE heart and arteries act upon the blood, in generating and keeping up its motion, in the following manner. When the auricles are filled with blood by the veins, the right auricle by the *vena cava*, and the left by the pulmonary vein, they both contract at the ſame time, and preſs the blood which they contain into the ventricles; and when the ventricles are filled with blood, they likewiſe contract at the ſame time, and preſs the blood which they contain into the arteries; the right ventricle into the pulmonary artery, and the left into the *aorta.*

THE arteries are dilated by the blood, forcibly preſſed into them by the ventricles; and as ſoon as the ventricles are emptied, and their contraction over, the

the dilated arteries contract, and preſs the blood forward into the veins. And thus the motion of the blood is generated and kept up, by the forces of the heart and arteries.

THE blood is kept from regurgitating, by the valves of the heart and veins. The valves, at the entrance of the auricles into the ventricles, open when the auricles contract, and permit the blood to flow into the ventricles; and ſhut when the ventricles contract, and prevent its return into the auricles. The valves at the origins of the *aorta* and pulmonary artery, open when the ventricles contract, and ſuffer the blood to flow into the arteries; and ſhut when the arteries contract, and hinder it from flowing back into the ventricles. And the valves of the veins open, to let the blood move forward toward the heart; and ſhut, to prevent its return into the arteries.

HENCE,

HENCE, 1. The two ventricles of the heart throw out equal quantities of blood in each ſyſtole: for if they threw out unequal quantities; then, ſince they always contract together, more or leſs blood would flow into the lungs, than flows out of them, in a given time: which muſt of neceſſity ſoon put an end to life.

2. AS much blood flows through each ventricle of the heart, and through the lungs, as flows through all the reſt of the body in the ſame time.

3. THE arteries have a pulſe, and the veins no pulſe: for the arteries have a ſtronger muſcular coat than the veins, from their ſuſtaining a greater preſſure againſt their ſides from the blood forced into them by each ſyſtole of the heart; and they ſuſtain a greater preſſure againſt their ſides, than the veins, from a greater reſiſtance to the blood forced into them by the heart. Now the ſides of both arteries and veins being

ſoft

ſoft and dilatable, it is evident, that the whole ſyſtem of veſſels muſt ſwell, when blood is forcibly preſſed into it by the heart in its *ſyſtole*; and endeavour to contract again, when the force of the heart ceaſes to act in its *diaſtole*: but when the arteries and veins begin to contract after every ſyſtole of the heart, the arteries by the greater ſtrength of their muſcular coat, overpower the veins; and by preſſing the blood into them hinder them from contracting: therefore the arteries by dilating and contracting, have a pulſe; and the veins for want of this alternate motion, have no pulſe.

SECT.

SECT. XI.

Of DIGESTION *and* NUTRITION.

THE nouriſhment of animals changes its texture in their bodies, till it becomes like their ſolid and durable parts.

FOR the ſolid and durable parts of animal bodies grow out of their nouriſhment: but their growth is from an addition and adheſion of like parts: and, therefore, the nouriſhment of animals changes its texture in their bodies, till it becomes like their ſolid and durable parts.

HENCE, I. Animals will not be rightly nouriſhed, when their nouriſhment changes not its texture in their bodies,

bodies, till it becomes like their ſolid and durable parts.

2. ALSO the nouriſhment by changing its texture in the bodies of animals, becomes more dry and earthy than it was before; otherwiſe, it would not be like their ſolid and durable parts.

THE firſt remarkable change in the texture of the nouriſhment is made in the ſtomach: in this bowel the ſolid parts of the food are diſſolved, and intimately mixt with the fluids. This mixture is uſually called *chyle*.

The texture of the nouriſhment is changed in the bodies of animals, by a gentle heat and motion.

SOME, from obſerving that fluids have a power of diſſolving bodies, have thought that a fluid in the ſtomach diſſolves the food and turns it into chyle: but as it appears not from experiments and obſervations, that there is a fluid in the ſtomach endued with ſuch a power, this opinion is without foundation.

OTHERS,

OTHERS, from obſerving the great ſtrength of the gizzards of fowls, and that there is commonly gravel found in them, have imagined, that the food is diſſolved in the ſtomach of fowls, and conſequently in the ſtomachs of all animals, by attrition or grinding. But if this opinion be examined, it will likewiſe appear to be without foundation. For the food of fowls is moſtly grain, all ſorts of which are hard, and covered with tough ſkins; and therefore, before this food can be diſſolved and turned into chyle, it muſt be ſoftned, and its ſkins ground off; the firſt of which is done by warmth and moiſture in the craw, and the ſecond by attrition in the gizzard. By theſe contrivances, the food of fowl is prepared and fitted for digeſtion; as human food is by cookery and other ways of preparing it, and by the grinding of the teeth. But if we ſhould grant, that the food of fowl is diſſolved and turned into chyle by attrition; it will by no means follow, that food is ſo diſſolv-

ed

ed and turned into chyle in a human ſtomach, which has no gravel in it, and has but very little muſcular ſtrength in compariſon of the gizzards of fowls. There may be many different contrivances in different ſpecies of animals, to ſoften, groſly divide, and prepare their food for digeſtion; but it will not from thence follow, that their food is digeſted or turned into chyle by different cauſes.

THE food is diſſolved and turned into chyle by a gentle heat and motion. Heat makes many bodies fluid, which are not fluid in cold. Lead is melted by a heat eight times as great as the external heat of a human body; tin, by a heat ſix times as great; wax, by a heat twice as great; and bones, with the addition of a little water, are diſſolved in a digeſter by heat in a little time. If the heat of the ſtomach be nearly equal to that of the blood; this heat, though gentle, may be ſufficient, when the orifices of the ſtomach

are pretty exactly cloſed, to diſſolve the food in a few hours, and turn it into chyle; eſpecially, when it is aſſiſted by the motion of the ſtomach, which, by agitating and mixing the food, will contribute to this end. For ſince heat can diſſolve ſolid bodies, and nothing is found in a human ſtomach, beſides a gentle heat and motion, which can diſſolve the food, and turn it into chyle; it will follow, that the food is digeſted or diſſolved, and turned into chyle, by a gentle heat and motion.

THE chyle in moving through the inteſtines is farther diſſolved by heat and motion: and the fineſt part of this fluid being conveyed into the blood, is ſtill farther changed by the ſame cauſes, *viz.* a gentle heat and motion, till it puts on the form of blood, and, at laſt, becomes fit to nouriſh the body, by being made like its ſolid and durable parts. The growth of the pullet in the ſhell out of the white of the egg, is a ſtrong proof of the truth of

of this: for here is manifeſtly nothing, beſides a gentle heat and motion, to change the white of the egg, ſo as to convert it into blood, and render it fit for nouriſhment for all the parts of an animal body.

HENCE animals will not be rightly nouriſhed, when the texture of their food is not rightly changed in their bodies by heat and motion; which may be owing, either to an unfitneſs in the food for ſuch a change, or to degrees of heat and motion unfit to effect it.

HAVING ſhewn that the nouriſhment of animals becomes more dry and earthy in their bodies, and that this change is effected by a gentle heat and motion: how a gentle heat and motion cauſe this change in the nouriſhment may appear plain from what Sir *Iſaac Newton* has ſaid concerning the nature of ſalt. He found, from ex-

periments and obſervations, that ſalts are dry earth and watry acid united by attraction, and that the earth will not become a ſalt without ſo much acid as makes it diſſolvable in water.

AS gravity makes the ſea flow round the denſer and weightier parts of the globe of the earth, ſo the attraction may make the watry acid flow round the denſer and compacter particles of earth for compoſing the particles of ſalt. For otherwiſe the acid would not do the office of a medium between the earth and common water, for making ſalts diſſolvable in water; nor would ſalt of tartar readily draw off the acid from diſſolved metals, nor metals the acid from mercury. Now as in the great globe of the earth and ſea, the denſeſt bodies by their gravity ſink down in water, and always endeavour to go towards the centre of the globe; ſo in particles of ſalt, the denſeſt matter may always endeavour to approach the centre of the particle: ſo that

that a particle of ſalt may be compared to a chaos; being denſe, hard, dry and earthy in the centre; and rare, ſoft, moiſt and watry in circumference. And whence it ſeems to be that ſalts are of a laſting nature, being ſcarce deſtroyed, unleſs by drawing away their watry parts by violence, or by letting them ſoak into the pores of the central earth by a gentle heat in putrefaction, until the earth be diſſolved by the water, and ſeparated into ſmaller particles, which by reaſon of their ſmallneſs make the rotten compound appear of a black colour. Hence alſo it may be that the parts of animals and vegetables preſerve their ſeveral forms, and aſſimilate their nouriſhment; the ſoft and moiſt nouriſhment eaſily changing its texture by a gentle heat and motion, till it becomes like the denſe, hard, dry, and durable earth in the centre of each particle. But when the nouriſhment grows unfit to be aſſimilated, or the central earth grows too feeble to aſſimilate it, the

motion ends in confuſion, putrefaction, and death *.

HENCE it appears, that to render the ſaline part of the aliment fit to nouriſh the ſolid parts of animals and vegetables, part of the ſuperficial watry acid muſt by heat and motion be drawn off from the particles of ſalt; by which they will become more denſe, hard, dry, and earthy, like the ſolid and durable parts of the bodies. And according to the different degrees of heat and motion in the different ſpecies of animals and vegetables, the watry moiſture will be drawn off in different proportions, ſo as in each ſpecies to render the particles like the ſolid parts of the bodies of that ſpecies.

AND farther, if we conſider that water is a very fluid taſteleſs ſalt, and that animals and vegetables, with their ſeveral parts, grow out of water and watry

* *Newt.* Opt. pag. 361, 362.

watry tinctures and ſalts; we may, from what has been ſaid, underſtand the manner in which the nouriſhment of animals and vegetables is changed by a gentle heat and motion, till it becomes like the ſolid and durable parts of their reſpective bodies.



SECT. XII.

Of the NOSE.

THE noſe, or, the organ of ſmelling, is, by anatomiſts, uſually divided into external and internal.

THE external is diſtinguiſhed into ſeveral parts, having each its proper name, as the *dorſum*, or ridge, running along the whole length of it; one part whereof about the middle, being more prominent than the reſt, is called the *ſpine*; and the extremity, which in many is turned round, the *orbiculus*, or tip of the noſe. The ſides are called the *alæ* or *pennæ*.

THE teguments of the noſe are common to the reſt of the face. Under

der theſe appear the muſcles of the noſe, which are three pair, *viz.* the *elevatores alæ naſi*, ſerving to pull the *alæ* upward, and turn them outward; the *dilatores alæ naſi*, which draw them from each other, and widen the external apertures of the noſtrils; and the *contractores alæ naſi*, which draw them downward nearer each other, and at the ſame time the upper lip alſo downward; which action we make uſe when we take ſnuff, or endeavour to receive any odoriferous *effluvia*.

THE frame of the noſe is chiefly ſupported by two bones, which end in cartilages, of a triangular figure; and are, in the middle, divided by a third, called *ſeptum*, into two partitions called the *nares* or noſtrils. This *ſeptum* likewiſe ends in a cartilage, by means of which, the lower part of the noſe is made moveable, which the upper, being perfectly bony, is not.

THE cartilages of the *alæ naſi* are tied to the other by ligaments, which looſe connexion renders them moveable.

THE bones of the noſe are either proper or common. The firſt of the proper are the two external ones that conſtitute the *dorſum* or ridge of the noſe, and are joined to the *oſſa frontis*, the *oſſa maxillaria*, and to each other, by harmony.

IN the concave of the arch of theſe two bones, at their union internally, is placed the bony part of the *ſeptum*. Its upper part joins the *os ethmoides*; but in adults is continued; ſo that the *ethmoides*, and its proceſs called *criſta galli*, appear to be one entire bone with this *ſeptum*. The *ſeptum* is thinneſt in the middle, and divides the right noſtril from the left, though its poſition is ſeldom perpendicular, but commonly inclines to one ſide or other. This *ſeptum* is capped with another thin bone, called *vomer aratri* from its figure, and joined

joined to the fourth bone of the upper jaw, and by harmony to the *ossa palati*.

THE other proper bones belonging to the nose, are the *turbinata*, or *spongiosa*, two of which are easily found in each nostril, sometimes three, one over the other. When there are three, the middle is so placed, as to shelter the perforation of the *antrum maxillæ superioris*, into the nostril, and prevent the sudden rushing in of air from the nostril into the *antrum*. These bones are very porous, and turned like the shell *concha Veneris*. In quadrupeds they are very numerous.

THE common bones of the nose are such as make the fences for the *foramina narium*, and help to compose the parts adjacent. The largest of these is the *ossa maxillaria* of the upper jaw, which has the greatest share in framing the *foramina*. Besides the cavities circumscribed by the bones now mentioned,

tioned, the *foramina* have ſeveral collateral cavities that open into them. The largeſt is called *antrum genæ*, or *antrum maxillæ ſuperioris*, framed in the fourth bone of the upper jaw, near two inches long, and one broad; the bony parts of which, with the *ſphenoides*, make the *foramen lacerum externum*. Its lower ſurface makes a thin covering to all the roots of the *molares*, and *canini*; which frequently on drawing a tooth, to which it ſticks, is taken along with it, whereby this cavity is opened into the *alveolus*, and conſequently into the mouth. All theſe cavities of the noſe and cheeks, alſo the *oſſa ſpongioſa*, *ſeptum*, &c. are inveſted with a membrane furniſhed with large arteries from the *carotides*, and veins that empty themſelves into the jugulars, and nerves from the fifth pair, as well as the olfactory nerves.

IN this membrane are a number of ſmall glands, placed near each other, from whence flows all the *pituita* commonly diſcharged at the noſtrils.

THE

THE *pituita*, or *mucus*, keeps the membrane ſoft, and defends it from the injuries of extraneous bodies, eſpecially thoſe of the air, which muſt paſs this way in inſpiration when the mouth is ſhut. By this means, the olfactory nerves, here diffuſed, are rendered capable of the perception of odoriferous *effluvia*, which otherwiſe the dryneſs of the part would be apt to deſtroy.

HERE we may plainly ſee nature's deſign, in framing ſo many cavities, turnings and windings in the *foramina narium*, which is to expand the olfactory nerves in a ſmall compaſs; and that ſmelling is only performed by inſpiration of the odoriferous effluvia of bodies, brought to a contact with the olfactory nerves.

BESIDES this uſe of the noſe, which is the principal, nature has made it a *diverticulum*, or by-paſſage to the eyes; for there is a conſiderable way into each noſtril, that empties itſelf under the middle

middle *os ſpongioſum*, ariſing from two apertures, called *puncta lachrymalia*, at the great *canthus* of the eye. By this way the ſuperfluous moiſture of the eyes is carried off, which would otherwiſe incommode the cheeks, as in effect it does, when any diſorder affects theſe paſſages, as in the *ægylops* and *fiſtula lachrymalis*.



SECT.

SECT. XIII.

Of the MOUTH *and* TONGUE.

THE mouth is a part of the human face, conſiſting of the lips, the gums, the inſide of the cheeks and the palate.

ALL theſe parts are lined with a glandulous coat, which is continued over the whole inner ſurface of the mouth, and all its parts, the teeth excepted.

FROM the glands of this coat, through innumerable excretory ducts, is ſeparated a kind of ſalival juice, which ſerves to keep the mouth, and

and all its parts, moiſt, ſmooth and ſlippery.

ON the hind part of the palate, perpendicularly over the *rima* of the *larynx*, hangs a round, ſoft, ſmooth body, like the end of a child's finger, formed by the duplicature of the membrane of the palate, and called the *uvula*, which is moved by four very ſmall pair of muſcles. (1.) The *gloſſoſtaphylinus*. (2.) The *pharingoſtaphylinus*: theſe two pair put down the *uvula* when we breath through the noſe. (3.) The *plerigoſtaphylinus internus*, pulls the *uvula* up, while we breath through the mouth, or ſwallow. (4.) *Plerigoſtaphylinus externus*, ſeems to move the *uvula* upward and forward. Under the membrane of the palate, are a great number of glands, pretty conſpicuous in the fore part, like grains of millet, whoſe excretory ducts piercing the membrane, open into the mouth: but toward the hind part they lie much thicker, and about the root of the

uvula

uvula are gathered ſo cloſe to one another, that they ſeem to form a large conglomerate gland, which is therefore, by *Verheyen*, called *glandula conglomerata palatina.*

THE gums, which are, as it were, the ligaments of the teeth, are formed inwardly of a production of the *perioſteum* of the jaws, and of the membrane of the mouth, which being firmly united, and wrapped hard about the roots of the teeth, hold them faſt in their ſockets; as appears by their dropping eaſily out, when the gums, are, by any accident or diſtemper, eaten away or relaxed, and rendered looſe and ſpongy.

BESIDES the proper parts of the mouth, there are in and about it, others highly ſerviceable and neceſſary thereto, among which are the glands; the moſt conſiderable whereof, are the *parotides*, the *glandulæ maxillares*, the *ſub-*

ſublinguales, and the *tonſillæ* or *amygdalæ*.

THE *parotides* are made up of a number of ſmall glands, and ſituate behind and below the ears, yet they have their excretory ducts running through the *buccinatores* to the upper jaw, and diſcharging themſelves into the mouth.

GLANDULÆ maxillares are conſiderable glands, and of the conglomerate ſort: they are ſituate on the inſide under the jaw-bone; the excretory ducts of their ſmall glands, unite and form two ducts, which both together open under the tip of the tongue, on the inſide of the *dentes inciſivi*, where they have each a ſmall *papilla* at their orifice. When the muſcles of the tongue or lower jaw act, they compreſs theſe glands.

THE *ſublinguales* are conſiderably leſs than the *glandulæ maxillares*, but likewiſe of the conglomerate kind, and lie

lie on each ſide below the tongue. Their excretory ducts are but ſmall, and running parallel with the *maxillares*, approach each other, and open at ſeveral apertures in the ſame *papillæ*, which are ſcarce diſcoverable, unleſs the glands are preſſed.

THE *tonſillæ*, or almonds of the ear, are two round glands, ſituate on the ſides of the baſis of the tongue, under the common membrane of the *fauces* with which they are covered. Each of them has a large oval *ſinus*, which receives a mucous matter from ſeveral leſſer ones, and diſcharges it into the *fauces*, *larynx*, and *oeſophagus*, to moiſten and lubricate them.

THESE are the ſalival organs, from whence ſpring all the liquor we call the ſpittle, which flows into the mouth by the reſpective ducts, after its ſeparation from the blood in the bodies of the glands: as the demand for ſpittle, is greater in the actions of the lower

jaw, that is, in maſtication, deglution, much talking, *&c.* ſo the diſpoſition of theſe ſalival ducts favours that diſcharge on thoſe occaſions.

THE tongue is an oblong part, whoſe form and ſituation are ſufficiently known, and whoſe uſe is to be the organ of taſte, and the principal inſtrument of ſpeech * and deglution. It is connected with the lower jaw, by means of a ligament running along the lower ſide of it, about half way, called *frænum*. It is alſo tied to the lower jaw and *larynx*, by help of a membranous ligament, and to the *pharynx*, *Os hyoides*,

* However neceſſary an organ the tongue be in ſpeech, *&c.* yet *Jac. Rolandus* has publiſhed an account of a mouth without a tongue, which ſpeaks perfectly, and performed its other natural functions; the perſon he ſpeaks of, is *Pet. Durand*, who loſing his tonge by a gangreen, could yet ſpeak perfectly, as alſo taſte, ſwallow, and chew his food; which laſt, however, he could only do on that ſide he put it into, being unable to turn it to the other ſide of his mouth. I do not queſtion *Jac. Rolandus* being an honeſt man; but I cannot help here being an infidel, if the tongue was wholly eradicated.

oides, and other neighbouring parts by ſeveral muſcles.

THE main bulk and body of the tongue, is made up of muſcles, covered on the upper part with a papillar nervous ſubſtance, over which are ſpread two membranes. The outer of theſe is thick and ſhort, and full of *papillæ*, of a pyramidal figure, eſpecially at the tip, which ſtand pointing toward the root of the tonge in a bending poſture; which makes their figure to be *concavo-convex*.

THESE *apices* or *papillæ* are, in men, ſo very minute and ſlender, that they make the coat appear on the upper part to be villous; eſpecially as they approach the root. The figure of the *papillæ*, in human tongues, cannot be diſcerned without a microſcope. In brutes they are generally larger, and ſtiffer; which are of great ſervice to thoſe who feed on graſs, becauſe they

gather it together with their tongue. On the upper ſide, at a little diſtance from the tip, this membrane is thin, ſmooth, and, as it were, poliſhed by the lower parts of the mouth whereon it ſlides.

UNDER this lies a thin ſoft net-form coat, lined with a thick and white yellowiſh mucus. This membrane is ſo exceeding tender and full of mucus, that it cannot be examined by the naked eye, unleſs boiled; whereby it grows tough, and eaſily ſeparable from the external membrane, and from the nervous part of the tongue, which lies immediately under it. After boiling, it appears like a kind of gawſe, between whoſe threads innumerable holes appear, through which the apices of the papillary body below it are exerted. This membrane on the upper ſide, next the outward, appears white, with a caſt toward yellow, but black on the ſide next the tongue.

MANY

MANY authors do not allow this to be a membrane, and will only have it be a mucus hardened by boiling; but ſince it ſo much reſembles a membrane, and that authors agree in allowing the tongue two membranes, Dr. *Drake* ſcruples not to number it among them; ſince there appears not to be any other ſecond membrane; reckoning with *Malpighi*, the ſmooth part under the tongue, a part of the outer membrane. Immediately under this, appears a nervous papillary body, ſpreading it ſelf, very thick, over the whole ſurface of the tongue. This body, on the underſide, is every where level and ſmooth, except in ſome few places where it is connected to the ſubjacent muſculous part, by ſome nervous twigs which it ſends into it. *Malpighi* diſtinguiſhes the *papillæ*, which make the principal part hereof, into three kinds, from their different magnitudes and figures, when obſerved by a microſcope; of which thoſe ſeated on the ſides and

tip, are very ſingular, reſembling little round pyramids, with globes on their tops, like ſnails horns. All theſe *papillæ*, which are the immediate organs of taſting, ſend their extremities through the mucous membrane, into the pyramidal *papillæ* of the outward membrane, which are hollow to receive them, and ſeem to be but a kind of caſes to defend theſe nervous *papillæ* from injuries, which the ſalts and aſperities of thoſe bodies we take into our mouths, might do them.

THE reſt, and much the greateſt part of the body of the tongue, is muſculous, conſiſting of plans of fibres in different directions: the firſt, or external plan, conſiſts of ſtrait fibres, which cover the tongue from one extreme to the other; when theſe contract, they ſhorten it. Under this are ſeveral other plans running from the under to the upper ſide of the tongue, which ſerve, when they contract, to make it broad

broad and thin. Theſe two kind of fibres lie *ſtratum ſuper ſtratum*, a plate of the one, and then a plate of the other, from the tip of the tongue to its baſis.

AUTHORS are not yet agreed about the number of muſcles which compoſe the tongue, ſome, confounding thoſe of the *Os hyoides* with thoſe of the tongue, reckon eight, others nine, others ten, ſet more. Some number thoſe proper to the tongue alone, ſix pair, others five, others four, and ſome no more than three. Of this laſt opinion, are Dr. *Keil*, and Mr. *Cowper*, who allow no more than three genuine pair of muſcles to the tongue, *viz.* 1. The pair *genioglo ſſum*, which ariſes from the inſide of the fore part of the lower jaw, and is inſerted into the root of the tongue; this pulls the tongue forward, and puts it out of the mouth. 2. The *ceratoglo ſſum*; it ariſes broad and fleſhy from the ſides of the *Os hyoides*, and is

inſerted into the root of the tongue, and draws it into the mouth, or pulls it on one ſide; and, 3. The *ſtyogloſſum*; it ariſes fleſhy from the *proceſſus ſtyloides*, from thence deſcending, it is inſerted into the root of the tongue, and draws the tongue up in the action of deglution.

BESIDES the muſcles, the tongue is alſo moved by a bone, called *Os hyoides*, which ſee under ſection I. ſituate at its root, and making, as it were, its baſis.

DOWN the middle of the tongue, lengthwiſe, runs a ſeam, called *linea mediana*, which divides it to the bottom into two equal parts, but not ſo effectually, but that the blood-veſſels of one ſide communicate with thoſe of the other. Theſe veſſels are arteries from the carotides and veins called *ranulæ*, and are very viſible about the *frænum* under the tongue, ſerving to convey

convey the blood to the external jugulars; theſe veins are often opened in the *angina*, and are the laſt reſort of old women in this caſe. The nerves of the tongue come from the fifth, ſixth, and ninth pairs; the two firſt of which have been called *guſtatorii*, and the latter *motorii linguæ*.



SECT.

SECT. XIV.

Of the EYE.

THE eye is that part of the body, whereby viſion is effected, that is, whereby viſible objects are repreſented.

THE eye is generally divided into internal and external parts; or into the eye, properly ſo called, and its appendages. Under the latter claſs, come the *orbit*; the *ſupercilium*, or eye-brow; the *palabræ*, or eye-lids; the *cilia*, or outermoſt edge of the eye-lids; and the *canthi*, or angles.

THE orbit is a large cavity wherein the eye is placed; its figure is pyramidal; it conſiſts of ſeven bones; *viz.* the *Os frontis*, *Os ſphenoidale*, *Os ethmoides*,

moides, *Os maxillare*, *Os malæ*, *Os unguis*, and *Os palati*.

THE edge is formed by the *Os frontis*, *Os maxillare*, and *Os malæ*; the bottom by the *Os ſphenoides* and *Os palati*; and all theſe bones, except the *Os palati*, contribute to form the ſides. The bottom is perforated by the *foramen opticum* of the *Os ſphenoides*, to give paſſage to the optic and other nerves; and the external ſide near this hole, by two orbitary fiſſures, one ſuperior, called *ſphenoidalis*, the other inferior, called *ſpheno-maxillaris*. The cavity of this orbit is lined by the production of the *dura mater*, which partly comes through the *foramen opticum* of the *Os ſphenoides*, and partly through the orbitary fiſſure. This membrane communicates with the *perioſteum* of the *baſis cranii* by the inferior orbitary fiſſure, and with the *perioſteum* of the face at the edge of the orbit.

THE

THE particular ſituation of the orbits repreſents nearly two funnels, placed laterally at a ſmall diſtance from each other, ſo as that their tops are almoſt joined, their neareſt ſides almoſt parallel, and the other ſides turned obliquely backward; and for this reaſon the middle of the edge of each orbit is farther diſtant from the *ſeptum narium*, than the bottom, and the edge is very oblique, the external angle of the orbit lying more backward than the internal.

THE eye-brow, in form of a ſegment of an ellipſis, is covered with hair ſpringing from ſome glands and fat, placed between the ſkin and *paniculus carnoſus*, on the upper edge of the bone, and is by nature contrived to ſtop the courſe of ſweat, and keep it from falling into the eye.

EACH eye has two eye-lids: the upper moves very quickly, and the lower ſcarce ſeems to move.

THE

THE upper eye-lid is lifted up by the *muſculus rectus*, which riſes from the bottom of the orbit of the eye, where the optic nerves pierce the *cranium*, and paſſing above the *muſculus ſuperbus*, is inſerted by a large tendon B, to the border of the eye-lid. Fig. 1. Plate XIV.

BOTH lids are brought to ſhut upon the eye by another muſcle, called *orbicularis:* it riſes from the great angle of the eye, and its fibres are ſpread two fingers breadth, covering the under lid; they reach to the little *canthus*, from which continuing its circular fibres that cover the upper lid, it is inſerted into the ſame place from whence it aroſe.

THE edges of the eye-lids have two ſmall and ſoft cartilages, like the ſegments of a circle, called *cilia*, *c c*; they keep the eye-lids extended, that every part may be equally raiſed. Upon them there is a rank of ſmall glands, whoſe ex-

excretory channels open on the edges of the lids.

THEY yield a wax, which, in ſleep, faſtens the eye-lids together: they are covered with the ſkin externally, and internally with the *conjunctiva*. On the edges of the lids are hairs in form of a palliſado, to break the too fierce impreſſion of the rays of light; and keep out flies and moats, and other things floating in the air, which might hurt the eye.

AT the joining of the eye-lids are formed two angles, or corners; that next the noſe is called *canthus major*, the other *minor*, E.

NEAR the *canthus minor* lies a ſmall gland of an oblong figure, called the *lachrymal gland*. From this gland proceed two or three ſmall ducts, which furniſh water enough to waſh off the duſt, and keep the outer ſurface of the eye moiſt, without which the

the *tunica cornea*, *c*, *c*, would be leſs pellucid, and the rays of light would be diſturbed in their paſſage; and that this liquor may be rightly diſpoſed of, we cloſe the eye-lids to ſpread it equally, when we are not conſcious of doing it. Fig. 2.

NEAR the *canthus major* are two ſmall perforations, called *puncta lachrymalia*, *d d*, which receive the ſuperfluous moiſture of the eyes, and carry it off into the *lachrymal* bag, through the *naſal canal* to the noſe it ſelf. At the entrance of the *lachrymal* bag is ſeated the *lachrymal caruncle*, D, that ſerves to keep the great angle of the eye from being totally cloſed, and thereby facilitates the falling of the tears into the *lachrymal* duct. Fig. 1.

HAVING conſidered the appendages, we ſhall now treat of the eye it ſelf, which is of a globular form, and conſiſts of tunicks, humours and veſſels.

THE

Fig. 2. THE globe of the eye is moved by four ſtrait and two oblique muſcles; between them there is a deal of fat, A, A, which facilitates the motion of the globe.

Fig. 3, 4. THE firſt of the four ſtrait muſcles is called *attollens* or *ſuperbus*, A; the ſecond *deprimens* or *humilis*, B; the third *adductor*, C; and the fourth *abductor*, D.

THE firſt of the oblique muſcles, is the *obliquus minor*, E; and the ſecond is the *obliquus major*, F*.

THE ſtrait muſcles are fixed by their poſterior extremities, at the bottom of the orbit, near the *foramen opticum*, in the elongation of the *dura mater* by ſhort narrow tendons; from thence they run wholly fleſhy toward the great circumference of the convexity of the globe, between the optic nerve and the *cornea lucida*, where

* G, The *trochlea* of this muſcle.

they

they are expanded into flat broad tendons, which touch each other, and afterward unite. Theſe tendons are firſt fixed by a particular inſertion, in the circumference juſt mentioned, and afterward continue their adheſion to the *cornea*, forming the white of the eye.

THE ſuperior oblique muſcle is fixed to the bottom of the orbit by a narrow tendon, as the *recti*, between the *rectus ſuperior* and *adducens*.

FROM thence it runs on the orbit oppoſite to the interſtice between theſe two muſcles, toward the internal angular apophyſis of the *Os frontis*, where it terminates in a thin tendon, which having paſſed through a ring, as over a pulley, runs afterward in a *vagina*, obliquely backward under the *rectus ſuperior*, that is, between the muſcle and globe; and increaſing in breadth, it is inſerted poſteriorly and laterally in the globe, near the *abductor*.

THE inferior oblique muſcle is ſituate obliquely at the lower ſide of the orbit, under the *humilis*, which conſequently lies between this muſcle and the globe. It is fixed by one extremity, a little tendinous, to the root of the naſal apophyſis of the *os maxillare*, near the edge of the orbit, between the opening of the naſal duct, and the inferior orbitary fiſſure; from thence it paſſes obliquely, and a little tranſverſly backward below the *deprimens*, and is fixed in the poſterior lateral part of the globe, by a flat tendon, oppoſite to, and at a ſmall diſtance from the tendon of the *obliquus ſuperior*, ſo that theſe two muſcles ſurround, in ſome meaſure, the outer poſterior part of the globe.

THE *attollens* moves the fore portion of the globe upward, when we lift up the eyes; the *deprimens* draws this part downward; the *adductor* toward the noſe; and the *abductor* toward the temples.

WHEN

WHEN the two neighbouring *recti* at the ſame time act, they draw the fore portion of the globe obliquely toward that ſide, anſwering the diſtance between theſe two muſcles; and when the four muſcles ſucceſſively act, they turn the globe of the eye round, which is what we call *rolling the eyes.*

WE may obſerve, that all the motions of the globe of the eye are made round its center, ſo that in moving the fore portion, all the other parts are likewiſe moved. Thus when the globe is turned toward the noſe, or upward; the inſertion of the optic nerve is at the ſame time turned toward the temple, or downward.

THE uſe of the oblique muſcles, is chiefly to counterbalance the action of the ſtrait, and to ſupport the globe in all the motions already mentioned. This is evident from their inſertions, which are in a contrary direction to thoſe of

the ſtrait; their fixed points with relation to the motions of the globe being placed forward, and thoſe of the ſtrait, backward at the bottom of the orbit. The ſoft fat, lying behind the globe, is inſufficient to ſupport it; neither is the optic nerve more fit for this purpoſe, becauſe it has a particular curvature at its inſertion in the globe, which allows it to be lengthened, conſequently prevents it from ſuffering any violence in the different motions of the eyes.

THE obliquity of theſe two muſcles, hinders them not from doing the office of a fulcrum, becauſe this is not a fulcrum diſtinct from the part moved, or on which the globe of the eye ſlides like the head of one bone in the articular cavity of another, but being fixed to the part, it eaſily accommodates it ſelf to all the degrees of motion thereof. Had theſe muſcles lain in a ſtrait direction, they would have incommoded the ſtrait; but their obli-

obliquity may be ſaid to be in ſome meaſure rectified by the inner ſurface of the orbit, and by the *abductor*.

THE inner ſurface of the orbit ſerves for a kind of collateral fulcrum, which hinders the globe from falling too far inward; as the joint action of the two oblique prevents it from falling too far outward. The *adducens*, by being bent on the globe, hinders it from being carried outward, and prevents the indirect motions of the oblique muſcles from thruſting it out of the orbit toward the temples.

THE tunicks, coats or membranes of the eye are four, the *adnata* or *conjunctiva*, the *ſclerotica*, *choroides* or *uvea*, and the *retina*.

THE *adnata* or *conjunctiva*, ſo called, becauſe it faſtens the eye in its orbit; it covers that part of the eye called the white, and, being reflected all round, lines the two eye-lids. It being

thus returned from the eye to the inſide of the eye-lids, hinders extraneous bodies from getting behind the eye into the orbit, and ſmooths the part it covers, which makes the friction leſs between the eye and the eye-lids. This coat is full of blood veſſels, as appears from the leaſt inflammation.

THE *ſclerotica* is a firm caſe, of a proper form, for the uſe of the other coats and humours. The fore part of this ſtrong coat being clear and like
Fig. 5. a horn, is called *cornea*, B, and the
Fig. 3. reſt *ſclerotica*, H *. The *cornea* is ſurrounded by the white: it has a greater convexity than the reſt of the globe, as it is compoſed of ſeveral parallel *laminæ*, nouriſhed by many blood-veſſels, ſo fine, as not to hinder the ſmalleſt rays of light from entring the eye. It has a moſt exquiſite ſenſe, ſo that, upon the leaſt pain, the tears may be ſqueezed out of the lachrymal glands,

* Fig. 5. A, A, A. the *ſclerotic* membrane diſſected. Fig. 7, C, C, C, its thickneſs.

to

to waſh off any filth, which, by ſticking to the *cornea*, might render it cloudy or dim*.

THE *choroides*, or *uvea*, B, B, B, Fig. 7. is a ſoft, thin, and black coat; and its inner, or concave ſurface is very ſmooth. It has a great number of blood-veſſels, which come from the ſecond, and are ſpread upon it; alſo ſeveral glands, which ſeparate from the blood-veſſels a black liquor that tinctures all this

* In the memoirs of the *French* academy, M. *Gandolphe* gives an inſtance of inciſions deſignedly made in the *Cornea*, to diſcharge a quantity of blood ſettled there by a violent blow on the eye, by which the ſight had been almoſt wholly extinguiſhed. The extravaſated blood, it ſeems, was in too great a quantity to be diſſipated by topical medicines; beſides, that proceſs would have been ſo tedious, that the aqueous humour would have been in danger of being in the mean time quite ruined. The *cornea*, therefore, was opened by three inciſions, all made acroſs; the blood was diſcharged; the eye bound up with compreſſes ſteeped in a mixture of four ounces of plantain water, and two of vulnerary water. In eight days the eye reſumed its natural tranſparency; and there remained no ſcar after the inciſions; yet, after the cure, the pupil continued dilated much beyond its natural dimenſions.

Fig. 6. membrane, C, C, *, internally, which otherwiſe is of a whitiſh colour. This coat has a hole, called *papilla*, *a*, for the paſſage of the rays of light.

THAT part of this coat, which makes the circumference of this hole, and lies on the ſides of the cryſtaline humour, is properly called the *uvea*, A, made of circular and ſtrait fibres; it contracts and dilates in proportion to the different impreſſions of light and objects.

* Was this membrane of a bright colour, it would reflect many of the rays upon the *retina*, and make a ſecond image on the firſt ſomewhat leſs, and leſs diſtinct, but both together ſtronger; which is the caſe of brutes of prey, where a great part of this coat is perfectly white, which makes them ſee bodies of all colours in the night better than men, for white reflects all colours; but brutes that feed only on graſs, have the ſame parts of this membrane of a bright green, which alſo helps them to ſee with leſs light, and makes graſs an object, that they can diſcern with the greateſt ſtrength; yet theſe advantages in brutes, neceſſarily deſtroy great accuracy in viſion, which is of little or no uſe to them, but to men of great conſequence.

ROUND the borders of the *cornea*, the *uvea* is firmly united to it, by means of a circle or ligament, called *ligamentum ciliare*, B, B. It is made of ſhort fibres running on the fore part of the *vitreous* humour, to the edges of the cryſtaline, like lines drawn from the circumference to the center. By the contraction of theſe fibres, the fore part of the eye is made more prominent, and the *retina* preſſed farther back from the cryſtalline humour, or the axis of viſion is lengthened when objects are placed too near the eye.

THE fibres of this ligament form the *iris*, which is that part ſeen toward the *cornea*: it is of different colours in different eyes, as grey, blue, hazzle or black.

THE *retina* *, A, A. ſo called from its reſembling a net, which covers the bottom of the cavity of the eye; it is a fine expan- Fig. 7.
ſion

* *a*, *a*, an inciſion made in the *retina*, above the vitreous coat.

ſion of the medullary fibres of the optic nerve, on the ſurface of the glaſſy humour, as far as the *ligamentum ciliare* to which it adheres.

THE *retina* is uſually ſuppoſed to be the great organ of viſion; which is effected by the rays of light reflected from each point of objects, refracted in their paſſage through the aqueous, vitreous, and cryſtaline humours, and thus thrown on the *retina*; where they paint the image of the object, and where they make an impreſſion, which is continued thence by the fine capillaries of the optic nerves to the *ſenſorium* *.

THE

* Whether the *retina* or *choroides* be the principal organ of viſion, and that whereon the images of objects are repreſented, has been much controverted between ſeveral members of the *French* academy, particularly Meſſ. *Mariotte*, *Pecquet*, *Perrault*, *Mery*, and *de la Hire*.

Mariotte firſt ſtood up for the *choroides*, and was ſeconded by *Mery*, the reſt aſſerted the rights of the *retina*.

The

THE humours of the eye are three, *viz.* the *aqueous*, the *cryſtaline* and the *vitreous* humours.

THE

The *retina* was always judged to have all the characters of the principal organ. It is ſituate in the *focus* of the refractions of the humours of the eye, and of conſequence receives the vertices of the cones of rays, proceeding from the ſeveral points of objects: it is very thin, and conſequently very ſenſible; it has its origin from the optic nerve; and is it ſelf wholly nervous, and it is the common opinion that the nerves are the vehicles of all ſenſations. Laſtly, it communicates with the ſubſtance of the brain, where all ſenſations terminate.

As to the *choroides*, its uſe was ſuppoſed to be to ſtop the rays, which the extreme thinneſs of the *retina* ſhould let paſs; and do the ſame office to the *retina*, as the quickſilver to the looking-glaſs, eſpecially in animals where it is black. But from an experiment of a cat plunged in water, M. *Mery* conceived a different opinion. He obſerved the *retina* abſolutely to diſappear on that occaſion, as well as the other humours of the eye; but the *choroides* ſtill to appear diſtinctly, and with all the lively colours it has in that animal. Hence he concluded, that the *retina* was as tranſparent as the humours, but the *choroides* opaque: conſequently the *retina* was not a proper inſtrument to terminate and ſtop the cones of rays, or to receive the images of objects; but that light muſt paſs through it, and could only be ſtopt on the *choroides*; which therefore would become the principal organ of viſion.

The

Fig. 8. THE *aqueous* humour, D, D, lies in the fore part of the globe, immediately under the *cornea*; this humour is

The black colour of the *choroides* in man, is extremely favourable to this ſentiment: the principal organ ſhould ſeem to require that the action of the light ſhould terminate on it, as it arrives; which it is certain it here does in the black, that abſorbs all the rays, and reflects none; and it alſo ſhould ſeem neceſſary that the action of light ſhould be ſtronger on the organ of the ſight than any where elſe; now it is certain that the light being received and abſorpt in a black body, muſt excite a greater vibration than any where elſe; and hence it is that black bodies are inflamed by a burning glaſs much ſooner than white ones.

The ſituation of the *choroides*, behind the *retina*, is another circumſtance on its ſide: M. *Mery* having obſerved the ſame poſition of the principal organ behind a mediate organ in the other ſenſes; which makes a happy analogy. Thus the cuticle extended over the skin, is the mean organ of feeling, but the cutis below is the principal organ. The like is obſerved in the ear, noſe, *&c.*

The *retina*, therefore, ſhould ſeem a kind of mediate or ſecondary organ, ſerving to break the too ſtrong impreſſion of the light on the *choroides*, or to preſerve it, which is the uſe aſcribed to the cuticle. Add to all this, that the *retina* is inſenſible, as having its origin from the medullary ſubſtance of the brain, which is ſo too; and the *choroides* on the contrary, very ſenſible, as ariſing

is thin and liquid, of a ſpirituous nature, for it will not freeze in the greateſt froſt: this ſhews the neceſſity of a continual ſupply for this humour, which in effect it has *.

THE

ariſing from the *pia mater*, which is certainly ſo in a great degree.

This laſt argument being doubted of, M. *Mery* was obliged to prove it; which he did before the royal academy; where he ſhewed that the optic nerve is not compoſed like the other nerves of fibres; that it is only a train of the *medulla* incloſed in a canal, out of which it is eaſily ſeparable. This ſtructure of the optic nerve, as yet unknown, ſhews that the *retina* can be no membrane; it is only a dilatation of the medulla incloſed under two membranes, and a medulla is no proper ſubſtance to be the ſeat of a ſenſation. It can ſcarce ſerve for any thing but to filtrate the ſpirits neceſſary for the action of viſion. The vibration whereby the ſenſation it ſelf is effected, muſt be made on a part more ſolid, more firm, and more ſuſceptible of a briſk impreſſion.

* Anatomiſts are divided about the origin and conveyance of this humour. 'Tis certain the ſource muſt be pretty plentiful, becauſe, if, by any accident, the coats, it is contained in, be wounded, ſo that the humour runs out, and the *cornea* falls, or collapſes, the wound readily heals, only by cloſing the eye, and the humour recruits: of which we have numerous inſtances among phyſicians. Dr. *Nuck* thinks he has diſcovered the

THE *cryſtaline* humour, A, lies next the aqueous, behind the *uvea*, oppoſite to the *papilla*, nearer the fore part than the back part of the globe; it is the leaſt of the humours, but more ſolid than any of them; its figure is a depreſſed ſpheroid, and is covered with a fine coat called *aranea* *.

the ducts whereby the humour is furniſhed: but others denying the reality of theſe ducts, ſuppoſe it immediately derived from the arteries. Dr. *Drake* admits the ducts, and takes them to be only branches of the excretory ducts of the *glandula innominata* and *lachrymalis*; which piercing the tunicks of the eye, ſend out their liquor by ways not yet diſcovered.

* This humour being of two conſiſtencies, outward like a gelly, but toward the center hard as ſalt; therefore ſome authors think its figure may be varied; which variation they ſuppoſe to be effected by the *ligamentum ciliare*. Hence Dr. *Grew* and others aſcribe to the ciliary ligament a power of making the cryſtalline more convex, as well as of moving it to or from the *retina*. By the laws of optics ſomething of this kind is abſolutely neceſſary to diſtinct viſion; for, the rays from diſtant objects, diverging leſs than thoſe from nigh ones, either the cryſtalline humour muſt be capable of being made more convex, or more flat; or elſe there muſt be an elongation of the eye, or of the diſtance between that and the *retina*.

THE

THE uſe of this humour is to refract the rays of light paſſing through it, ſo that each pencil of rays from the ſame point of any object may be united on the *retina*, to make the ſtronger impreſſion; and though by this union of the rays, a picture inverted is made upon the *retina*, yet it is only the impulſe of the rays on the *retina*, that is the cauſe of viſion; for had the colour of the *retina* been black, and conſequently unfit to receive ſuch a picture, would not the impulſe of light upon it have been ſufficient for viſion? or would ſuch a picture, if it could have been made without any impulſe, have ever conveyed any ſenſation to the brain? Then if the impulſe of light, and not the image, on the *retina*, is the cauſe of viſion; when we enquire why an image inverted in the eye, appears otherwiſe to the mind, may we not expect to find the true cauſe from conſidering the directions in which the rays ſtrike the *retina*; yet in viewing an object

object through a lens, we conceive of it as inverted; whereas in receiving the impulſes of light in the ſame manner, and having the picture on the *retina* in the ſame poſture, when we ſtand on our heads without the lens, we have not the ſame, but the contrary idea of the poſition of the object *.

THE *vitreous* humour, C, C, has a great reſemblance to the white of an egg; it fills all the hind part of the cavity of the globe, and is in greater plenty than the other two: it is thicker than the aqueous, but thinner than the cryſtaline humour, it is contained in a very fine coat of the ſame name, and gives the ſpherical figure to the eye. Upon its back part

* This humour has here been conſidered only as a refractor of light; yet the firſt and greateſt refraction is certainly made in the *cornea*; but it being *concavo-convex*, like glaſſes of that kind, while one ſide makes the rays of light to converge, the other diverges them again. The ſame may alſo be obſerved of the aqueous humour, which is more concave than convex.

PLATE XIV.

FIG. I.

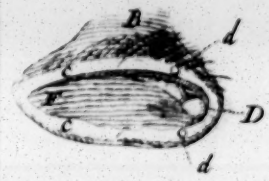


FIG. II.

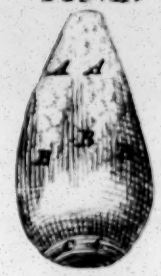


FIG. III.

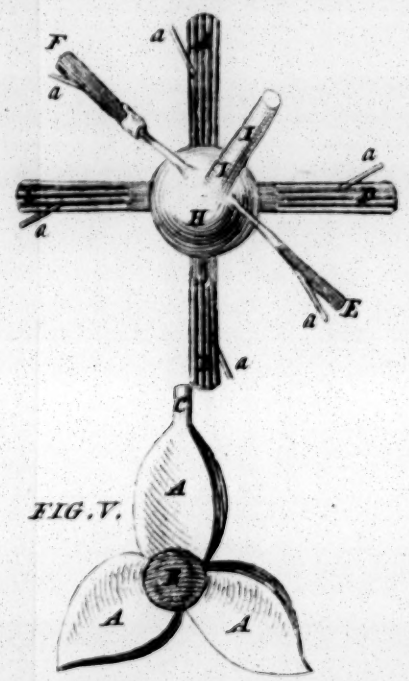


FIG. IV.

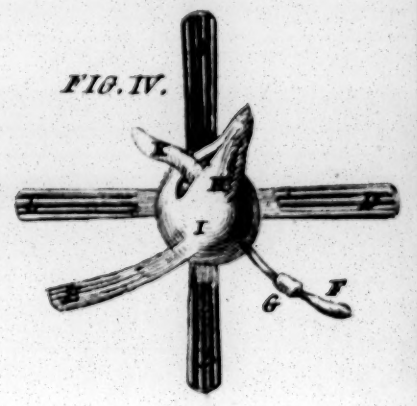


FIG. V.

FIG. VI.

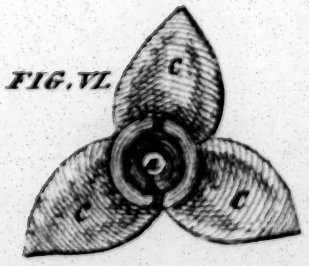
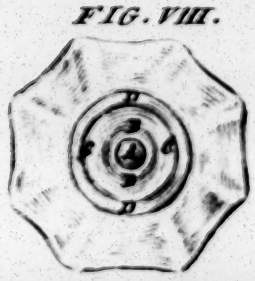


FIG. VII.



FIG. VIII.



Fletcher Sculp.

part the *retina* is ſpread; it ſerves as a medium to keep the cryſtaline humour and *retina* at a due diſtance.

THE optic nerves I, or D, are the ſecond pair of nerves ſpringing from the *crura* of the *medulla oblongata*, and paſſing thence to the eye. Theſe nerves approach by degrees, in their receſs from their origin, and at length meet in the baſis of the brain near the *infundibulum*; thence they again ſeparate, but without decuſſating, and proceed, one to each eye. They are covered with two coats, which they take from the *dura* and *pia mater*; and which, by their expanſions, form the two membranes of the eye, called the *uvea* and *ſclerotica*; and the *retina*, as before mentioned, is only an expanſion of the fibrous, or inner, and medullary part of theſe nerves *. Fig 3, 7.

* The conſtruction of the optic nerve ſeems to be different from that of the other nerves, which all appear to conſiſt of hard fibres; for this, ere it enters the

FROM what has been ſaid of the eye, it appears, that the whole ſtructure and apparatus of the eye tends to this, that there be produced a diſtinct and vivid collection in the bottom of the eye, directly under the pupil, of all the rays, which, proceeding from any point of an object, and entering the eye, penetrate the cryſtalline humour, and that ſo many points be painted in the bottom of the eye as are conſpicuous in the object; that ſo a ſmall image like thereto may be repreſented on the *retina*. In order to this, the rays, from any radiant or reflecting point, ſtriking on the *cornea*, are refracted toward the perpendicular, and

the orbit, is only a coat or cover formed by the *pia mater*, and including a production of the medulla of the brain; which is eaſily ſeparated from it. At its entrance into the eye, it takes another coat from the *dura mater*; which two coats are bound together by very fine filaments; that from the *pia mater* is continued in the *chorcides*, and that from the *dura mater* in the *uvea*. From their entrance within the orbit, to the ball of the eye, the *medulla*, incloſed under the two coats, is ſeparated into a number of little cells anſwering to each other.

and thus determined to proceed through the aperture of the pupil, to the ſurface of the cryſtaline; while other rays, which entered ſo obliquely as to be thrown upon the *iris*, are reflected out again, that they may not diſturb the diſtinctneſs of the ſight; and others, whoſe leſs obliquity threw them between the *uvea* and vitrious humour, are extinguiſhed in the darkneſs thereof; ſo that none can be propagated through the vitrious, but ſuch as paſſing through the pupil ſtrike on the cryſtaline.

WHILE the *iris*, contracting by its circular, or dilating by its right fibres, the pupil of the eye, admits fewer, or more rays, as the object is nearer or more vivid; or remoter or more languid. Now the flatter the figure of the *cornea* is, the leſs it collects the rays emitted from any lucid point; whence fewer arrive at the cryſtaline, and thoſe more diverging, unleſs when they come from a very

remote object: on the contrary the rounder it is, the more of the rays does it collects from any point, and throws on the cryſtaline; and thoſe the more converging: whence one great cauſe of the defects in the eyes both of old men and *myopes*, or purblind people.

AGAIN, the rays tranſmitted through the pupil to the cryſtaline are there refracted a-new, further collected, and rendered converging; ſo as that thoſe, which came from the ſame point of the object, are now thrown in one point through the vitreous upon the *retina*, where they paint, or exhibit that preciſe point of the object whence they flowed. If the cryſtaline be very denſe, or ſpherical, the focus, or the point, wherein they are united, will be too near; and, if too flat, or thin, the point will be too remote: the effect of both which is confuſion. And hence another caſe of the defects of *myopes* and *presbytæ*, or thoſe people who

who ſee diſtant things clearly, but thoſe near at hand confuſedly.

IT is not, however, *myopes* and old men alone that would labour under theſe defects, and have their viſion, in moſt caſes confuſed, as in objects very near, or very remote, very ſmall, or very great; but thoſe would be the common condition of viſion.

DISTINCT viſion, depending abſolutely on the union of all the rays coming to the ſame point of the object, on the ſame point of the *retina*, and rays from objects at different diſtances, being united at different diſtances behind the cryſtaline; it were impoſſible, *e. gr.* for the ſame eye to ſee diſtinctly any two objects differently removed from it. But nature has made a proviſion againſt theſe defects; and that principally, by bringing the cryſtaline nearer the *cornea* or farther from it, occaſionally; which is effected two ways, *viz.* either by compreſſing the

bulb of the eye by the four muſcles all ſtrongly contracted at once, which changes the figure of the *aqueous* humour, and makes the eye oblong; or by the *ciliary ligament*, augmenting or diminiſhing the convexity of the cryſtaline and ſetting it nearer and farther from the *retina*.

As complex as the *mechaniſm* of the eye may ſeem, and as manifold as the parts are which have a relation hereto; the juſtneſs of viſion ſeems to require an exact habitude in them all. Thus though the pupil be no ſubſtantial part of the eye, but only an aperture of the *uvea*, almoſt perpetually changing its bigneſs, according to the different degrees of light the eye chances to be expoſed to; and therefore ſhould ſeem, while this hole remains open, to perform its office, by giving entrance to the incident rays of light; yet Mr. *Boyle* ſaw a woman, who, after a fever, not being able to dilate the *pupillæ* of her eyes, as before, though

though they were very little narrower than ordinary, yet had thereby almoſt loſt her ſight. And, on the other ſide, though a competent wideneſs of the pupil be requiſite to a clear and diſtinct viſion, yet if its dilation exceeds the due limits, there is thereby produced a conſiderable diſtemper of ſight.

IT may ſeem alſo but a ſlight circumſtance, that the tranſparent coats of the eye ſhould be devoid of colour; and of as little moment, that the *cornea* ſhould be very ſmooth, provided it remain tranſparent; yet when either of theſe circumſtances is wanting, the ſight is greatly vitiated. Thus we ſee that in the yellow jaundice, the adventitious colour, wherewith the eye is tinged, makes the patient think he ſees many objects yellow, which are of a contrary colour.

THE comparative ſtructure and anatomy of the eye is very curious: the ſituation, number, conformation, *&c.*

of this organ in different animals, being finely and wonderfully adapted to their different circumſtances, occaſions, and manners of living.

IN man, and ſome other creatures, the eye is placed chiefly to look forward; but ſo ordered as to take in nearly the hemiſphere before it. In birds, and ſome other creatures, the eyes are ſo ſeated as to take in near a whole ſphere, that they may the better ſeek their food, and eſcape danger. In others they are ſo ſeated as to ſee behind them, or on each ſide, whereby to ſee the enemy purſuing them: thus in hares and conies the eyes are very protuberant, and placed ſo much toward the ſide of the head, that their two eyes take in nearly a whole ſphere; whereas in dogs that purſue them, the eyes are ſet more forward in the head, to look that way more than backward.

GENE-

GENERALLY the head is contrived to turn this and that way, chiefly for the occaſions of the eyes; and generally the eyes themſelves are moveable upward, downward, backward, ſidewiſe, for the more commodious reception of the viſual rays. Where nature deviates from theſe methods, ſhe always makes uſe of very artful expedients to anſwer the ſame end.

THUS in ſome creatures, the eyes are ſet more at a diſtance from the head, to be moved here and there, the one this way, and the other that; as particularly in ſnails, whoſe eyes are contained in their four horns, like atramentous ſpots fitted to the end of their horns, or rather to the ends of theſe black filaments or optic nerves, ſheathed in the horn. And in other creatures, whoſe eyes or head are without motion, as in ſeveral inſects; that defect is ſometimes made up by having more eyes than two; as in ſpiders, which having no neck, and conſequently the head being

being immoveable, the defect is ſupplied by the ſituation and multiplicity of their eyes; ſome having four, ſome ſix, and others eight, all placed in the front of the head, which is round, like a locket of diamonds. The reaſon Dr. *Power* gives, is, that being to live by catching ſo nimble and ſhy a prey as flies, they ought to ſee every way, and ſo take her *per ſaltum*, without any motion of the head to diſcover them.

AGAIN, men, and moſt quadrupeds, are fond of having ſeveral muſcles belonging to their eyes, whereby they can turn them any way, and ſo obvert the organ of ſenſe to the object. But nature not having given that mobility to the eyes of flies, ſhe, in recompence, furniſhes them with a multitude of little protuberant parts, finely ranged upon the convex of their large bulging eyes; ſo that by theſe numerous little ſtuds, numberleſs rays of light are reflected from objects, placed on either hand, above or beneath the level of the

eye,

eye, and conveniently thrown upon that organ, to render the objects they come from, visible to the animal; and by the help of a good microscope, and a clear light, some hundreds of these little round protuberances may be discovered, curiously ranged on the convexity of a single eye of an ordinary flesh-fly. So scorpions are found to have above a hundred eyes, and *Swammendham* has observed no less than two thousand in the little insect called *ephemera*.

IN other creatures the like deficiency is supplied by having their eyes nearly two protuberant hemispheres, each consisting of a prodigious number of other little segments of a sphere.

THE eyes of a *Cameleon*, Dr. *Goddard* observes, resemble a lens or convex glass, set in a versatile globular socket, which she turns backward and forward without stirring the head, and often

often the one a contrary way to the other.

LASTLY, *moles*, which the antients, *Ariſtotle*, *Pliny*, *Alb. Magnus*, &c. ſuppoſed to have no eyes, are now found to furniſh a notable inſtance of the diverſity of the *apparatus* of viſion. For that animal living wholly under ground, ſight would generally be uſeleſs to it, and ſo tender a part of the eye troubleſome. It has eyes, but thoſe ſo exceeding ſmall, and ſo far ſituate in the head, and covered ſo ſtrongly over with hair, that they cannot ordinarily be of ſervice or diſſervice to it. Yet to guide and ſecure it a little, when it chances to be above ground, *Borrichius*, *Blaſius*, *Schneides*, Mr. *Derham*, and others, obſerve that it can protend, or put them forth beyond the ſkin, and again draw them back at pleaſure, ſomewhat after the manner of ſnails.

IN the eyes of nocturnal animals, is a part not yet mentioned, *viz.*

a ſort of *tapetum* at the bottom of the eye, which gives a kind of radiation on the pupil enabling them to ſee and catch their prey in the dark. Thus Dr. *Willis*; *hujus uſus eſt oculi pupillam quaſi jubare inſito illuminare, quare in fele plurimum illuſtris eſt, at homini, avibus & piſcibus deeſt.* He adds, that in ſome perſons the *iris* has a faculty of darting out light; and inſtances in a man of a hot head, who, after a plentiful drinking of generous wine, could ſee to read in the darkeſt night. The like *Pliny* tells us of *Tib. Cæſar*, that upon his firſt waking in the night, he could ſee every thing for a little while as in broad day light *. And Dr. *Briggs* gives a like inſtance of a gentleman in *Bedfordſhire* †.

FROGS, beſide the parts of the eye which they have in common with men and moſt quadrupeds, have a peculiar membrane

* Nat. Hiſt. Lib. 2. Cap. 37.

† *Ophthalm.* Cap. 5. §. 12.

membrane or cartilage, which is not commonly perceived, wherewith they can, at pleaſure, cover the eye without too much hindring the ſight, becauſe the membrane is both tranſparent and ſtrong, ſo that it may paſs for a kind of moveable *cornea*, or occaſional ſafe-guard to the eye.

IN furniſhing frogs with this ſtrong membrane, the providence of nature ſeems very conſpicuous; for they being amphibious creatures, deſigned to paſs their lives in watry places, which for the moſt part abound in plants, endowed with ſharp edges, or points; and the progreſſive motion of this animal, being not by walking, but by leaping, if his eyes were not provided with ſuch a caſe, he muſt either ſhut them and ſo leap blind-folded, or by leaving them open, muſt run the riſk of having the *cornea* cut, pricked, or otherwiſe offended: but this membrane, like a kind of ſpectacle, covers the eye, without taking away the ſight;

and

and as ſoon as the occaſion for it is over, the animal withdraws it into a little cell, where it reſts, till its uſe be again required. This membrane becomes viſible by applying the point of a pin, or any ſuch ſharp thing, to the eye of a frog, whilſt his head is held ſteady; for to ſcreen his eye, he will preſently cover it therewith, and afterward withdraw it upon the removal of the ſuſpected danger. And becauſe many birds are deſtined to fly among the branches of trees and buſhes, leſt by this means the prickles, twigs, leaves, *&c.* ſhould wound or offend their eyes, nature has alſo given them ſuch another kind of horny membrane as we ſee in frogs.

SECT.

SECT. XV.

Of the Structure of the EAR.

THE *ear* is the organ of hearing; or, that part whereby the impreſſion of ſounds is received, and is generally divided into external and internal.

THE external ear, is that part, which lies without the external orifice of the *meatus auditorius* in the *Os temporis*; and the internal ear is that part which lies within the cavities of that bone, and alſo the parts that bear any relation hereto.

THE external ear, all taken together, reſembles almoſt the ſhell of a muſcle, with its broad end turned upward, the ſmall end downward; the convex ſide next the head, and the concave

concave ſide outward. Two portions are diſtinguiſhed in the external ear taken all together, one large and ſolid, called *Pinna*, or *Ala*, which is above, and by much the greateſt part; the other, which is narrower, ſofter and pendant, and which makes the lower part, called the *Lobe*, E, or *Fibra*. Plate XV. Fig. 1.

THE foreſide is divided into eminences and cavities. The eminences are four, called *Helix*, *Anthelix*, *Tragus* and *Antitragus*. The *helix*, A, B, is the outer circle or border of the ear. The Fig. 1, 2. *anthelix*, B, is the large oblong eminence or riſing ſurrounded by the *helix*. The Fig. 1. *tragus*, D, is the prominence above the *lobe* toward the face, which, in an advanced age, is covered with hairs. The *antitragus*, C, is the tubercle at the lower end of the *anthelix*, oppoſite to the *tragus*.

THE cavities in the fore ſide are four, the hollow of the *helix*, the depreſſion at the ſuperior extremity of

the *anthelix*, called *foſſa naviculariſ*, the *concha*, H, or great double cavity that lies under the riſing, termed *anthelix*, the upper part of which is diſtinguiſhed from the lower by a continuation of the *helix*, in form of a tranſverſe *criſta*; and, the *meatus* of the external ear, ſituate at the lower part of the bottom of the *concha*.

THE backſide of the external ear, ſhews only one conſiderable eminence, which is a portion of the convex ſide of the *concha*, the other portion being hid by the adheſion of the ear to the *Os temporis*. This adheſion hinders us from ſeeing the hollow anſwering to the *criſta*, by which the cavity of the *concha* is divided.

THE greateſt part of the external ear, conſiſts of a large cartilage very artificially framed, which is the baſis of all the other parts of which this portion of the ear is made up. This cartilage is not of the ſame thickneſs every

every where; it is covered with integuments on both ſides, and in the lobe it is wanting.

THE cartilaginous portion of the external *meatus auditorius* makes not a compleat circle; in one ſide of which there is a break, and which terminates in an oblique border, fixed to the edge of the bony canal by ſeveral ſmall inequalities, as by a kind of ingrailing; and from this obliquity the cartilaginous border terminates downward in a point. The lateral break in this cartilage, is between the upper and back part of its circumference, which, in regard to the *meatus*, obliquely repreſents tranſverſe fiſſures. The anterior fiſſure is almoſt quadrangular; the intermediate parts are not always oppoſite to each other, for the uppermoſt is a little further from the *Os temporis* than the poſterior.

THE external ear is fixed to the *cranium*, by a cartilaginous portion of

the *meatus*, and two ligaments, one anterior, the other poſterior. The anterior ligament is fixed by one extremity to the root of the *apophyſis zygomatica* of the *Os temporis*, at the anterior and a little toward the ſuperior part of the *meatus oſſeus*, cloſe to the corner of the glenoide cavity; and by the other extremity to the anterior and ſuperior part of the cartilaginous *meatus*. The poſterior ligament is fixed by one end to the root of the maſtoide apophyſis, and by the other, to the poſterior part of the convexity of the *concha*, ſo that it is oppoſite to the anterior ligament.

OF the muſcles of the external ear, ſome go between the cartilages and the *Os temporis*, others are confined to the cartilages alone. Both kinds vary in different ſubjects, and are ſo very thin, that they appear rather ligaments than muſcles.

THE

THE muſcles of the firſt kind are one ſuperior, one poſterior, and one anterior. The ſuperior muſcle, A, is fixed in the convexity of the *foſſa navicularis*, and of the ſuperior part of the *concha*; from whence it runs up to the ſquammous portion of the *Os temporis*, expanding in a radiated manner, though not of the ſame degree in all ſubjects, and is principally inſerted in the ligamentary *aponeuroſis*, which covers the poſterior portion of the temporal muſcle. The anterior muſcle, E, is ſmall, more or leſs inverted, and like an appendix to the ſuperior. It is fixed by one extremity above the root of the *zygomatic apophyſis*, and by the other, in the fore part of the convexity of the *concha*. The poſterior muſcle, C, is almoſt tranſverſe, and of a conſiderable breadth, being fixed by one end to the poſterior part of the convexity of the *concha*, and by the other, in the root of the *maſtoide apophyſis*. It covers the poſterior ligament. Fig. 2.

THE ſmall muſcles, confined to the cartilages, are only *ſtrata* of fibres on both ſides of the cartilages. Of this number are thoſe, D, D, which *Valſalva* diſcovered in the different cavities on the back ſide of the cartilage, and thoſe found by *Santorini* on the *tragus*, and along the convex part of the anterior portion of the *helix*.

THE ſkin of the external ear is a continuation of that which covers the neighbouring parts of the temporal region. The ſkin on the fore ſide of the ear is accompanied by a ſmall quantity of cellular ſubſtance, and therefore we find all the eminences and cavities of that ſide marked upon it to the bottom of the external *meatus*. In what has been ſaid of the ſkin, the *epidermis* is likewiſe comprehended.

THE backſide is covered by the ſkin continued from the fore ſide; but as the folds are there very cloſe, it only paſſes over them, except that portion

tion of the *concha*, which ſurrounds the entry of the *meatus auditorius*, and which is joined to the *Os temporis* by the cellulary ſubſtance. The cavity of that common fold, lying between the *anthelix* and *concha*, appears not on the backſide; for as it is filled with a cellular ſubſtance, the ſkin paſſes over it.

THE lobe of the ear is only made up of a ſkin and cellular ſubſtance.

THE *meatus auditorius* is a conduit that goes from the *concha* to the *tympanum*; and is partly cartilaginous and partly bony. The cartilaginous part is formed by the contraction of the *concha*; it is about an inch long, and $\frac{1}{10}$ inch wide; the cartilage, which forms it, continues the ſame in itſelf, but is interrupted and ſeparated in many places, as it were, by different cuttings, which are only articulated by the ſkin that lines the inſide of the conduit. This cartilaginous part covers but half

the conduit, the upper part being almoſt cloſed by the ſkin, wherewith it is entirely covered.

THIS ſkin, being that which is before the ſhell, is ſtrewed with a great many little glands, A, of a yellow colour and oval figure, laid ſomewhat deep under the ſkin. Each gland has a ſmall pipe opening in the cavity of the conduit, among the hair, with which it is ardorned. Theſe capillary tubes furniſh that thick, glutinous, and yellowiſh matter found in the *meatus auditorius*. This cartilaginous conduit terminates in articulating with many inequalities at the entry of the bony canal. Theſe inequalities are very conſiderable at that part of the entry, next the face; and the cartilage articulates there very firmly; but as there are few of theſe inequalities at the oppoſite part, which is next the hind part of the head, the articulation of the cartilage with the bone is made in that place by a ſtrong ligament, which, coming

Fig. 3.

coming from the extremity of the *concha*, paſſes along the membranous part of the cartilaginous conduit, and enters a little cavity in the bone of the temples, at the entrance of the bony canal.

THIS bony part of the *meatus auditorius* is a canal, which appears added to the bone of the temples. This conduit is the continuation, or, rather the foundation of the cartilaginous conduit. At the beginning, its hole is ſomewhat oval, and it grows narrower in proportion as it comes nearer the extremity. The *meatus auditorius* has a ſerpentine direction, which is firſt up and down, backward and forward to the middle of its courſe, then crooks and deſcends again, going always from the hind to the fore part, till it reaches the membrane of the *tympanum*, F. Fig. 3. which is a thin, tranſparent, flattiſh pellicle of an oval figure ſtretched out like the head of a drum, making an obtuſe angle with the upper and back part

part of the *meatus*, and an acute angle with the lower and fore part. This membrane is ſet in a bony circle of the temporal bone, and wants about $\frac{1}{24}$ inch to make it a compleat circle.

IT is made up of ſeveral very fine *laminæ*, cloſely united together *. The external *lamina* is in ſome meaſure a production of the ſkin and *cuticula* of the external *meatus:* the internal *lamina* is a continuation of the *perioſteum* of the *tympanum*, and when the membrane has been firſt macerated in water, each of theſe *laminæ* may be ſubdivided into ſeveral others.

THE

* *Valſalva* ſays, that this membrane is double, being compoſed of the ſeveral membranes that line the cavities of the *meatus* and *tympanum*. Ex duplici, diverſaque expanſione membranacea tympani membrana componitur (quæ compoſitio in humano fœtu pateſcit); nam dura mater tympani cavitatem ingreſſa per commiſſuram, quæ inter os temporale & petroſum occurit, & expanſa per eandem cavitatem, quò uſque pertingat ad indicatum oſſeum ſulcum; huic committitur, & per totum anuli intermedium ſpatium extenditur,

THE depreſſion in the middle of the membrane of the *tympanum* is cauſed by the adheſion of the hammer, the handle of which is cloſely articulated to the inſide of the membrane, from the upper part of the circumference, all the way to the center whereto the end of the handle is fixed. This handle ſeems to lie in a very fine membranous duplicature, whereby it is tied to the membrane of the drum, and which ſerves it for a *perioſteum*.

BEHIND this membrane, there is a pretty large cavity called the *cavity of the drum*; it is about $\frac{1}{3}$ inch deep, as much wide, and $\frac{1}{4}$ inch high. It is lined with a fine membrane, on which

ditur, internam producens tympani membranæ faciem: cui altera membranea expanſio acute meatum auditorium inveſtiente proveniens, itidem in oſſeo firmata ſulco, unitur, externam ejuſdem membranæ faciem conſtituens. A qua, uſque adhuc ignota, compoſitione, ex duræ matris ſcilicet, & cutis membraneis expanſionibus, conſiderabilis membranæ tympani firmitas, & robur dependet.

which there are ſeveral veins and arteries, and always full of a purulent matter in children.

IN the cavity of the drum are the *malleus*, *incus*, *ſtapes*, and *Os orbiculare*.
Fig. 3. The *malleus*, C, has on the lower ſide of it head two protuberances and a cavity, whereby it is joined to the *incus* by *ginglymus:* its handle, which is long and ſmall, is faſtened to the membrane of the drum: its whole length is about $\frac{1}{4}$ inch, it has near its head two ſmall proceſſes, and is moved by three muſcles, one external, one anterior, and one internal.

THE external or ſuperior muſcle of the *malleus*, is a thin *faſciculus* of fleſhy fibres lying along the upper part of the *meatus audoritus*, between the *perioſteum* and the other integuments. The outer part of this muſcle is broad, and it contracts as it advances toward the upper part of the orbicular groove of the drum, into which it enters

enters by a ſmall tendon, above the membrane of the drum, and is inſerted in the neck of the *malleus*, near the ſmall eminence of the handle.

THE anterior muſcle of the *malleus* is fleſhy, long, and thin. It runs along the out ſide of the *Euſtachian* tube, G, c, to which it adheres very cloſely. Its anterior extremity is fixed in that ſide of the tube before the *Os ſphenoides*, and the poſterior extremity ends in a long thin tendon, which runs in the articular fiſſure of the *Os temporis*, through a ſmall oblique notch, in which fiſſure it enters the drum, and is inſerted in the ſlender proceſſes of the hammer, aſſiſting the former muſcle in its action. Fig. 3, 5.

THE internal muſcle of the *malleus* is very fleſhy and diſtinct; it ariſes from the extremity of the bony part of the conduit that leads to the jaws, and lies in a *ſinus* of the *Os petroſum*, till it paſſes over a little riſing of the bone

bone at the *feneſtra ovalis*, to be inſerted into the poſterior part of the handle of the *malleus*. This muſcle, by pulling the hammer inward, diſtends the *membrana tympani*.

Fig. 3. THE *incus*, B, the ſecond ſmall bone of the ear, has a head and two legs. Its head, which is about $\frac{1}{6}$ inch long, above $\frac{1}{12}$ broad, and but $\frac{1}{24}$ thick, has a protuberance and two cavities, whereby it is articulated with the hammer; the ſhorter leg is tied to the ſide of that conduit that goes to the *proceſſus mammillaris*, and its longer leg to the head of

THE *ſtapes*, the third bone of the ear, has two branches ſituate a upon flat and oval baſis, ſtanding upon the *foramen ovale*. The ſpace between the two branches is filled up by a fine tranſparent membrane; the union of the two branches, is called the head of the ſtirrup, in which there is a ſmall cavity, wherein the fourth bone lies. The height of the *ſtapes* is about

about $\frac{1}{6}$ inch, the length is above $\frac{1}{12}$ inch and the breadth $\frac{1}{24}$ inch. The muſcle of the *ſtapes* is ſhort and thick, and lies concealed within a ſmall bony pyramid at the bottom of the drum. The cavity, which it fills, touches nearly the bony canal of the *portio dura* of the auditory nerve; and it terminates in a ſmall tendon, going out of the cavity through a ſmall hole in the apex of the pyramid.

THE *Os orbiculare*, z, is a very ſmall bone, convex on that ſide, which is received in the cavity of the head of the ſtirrup, and concave on the other, where it receives the long leg of the anvil, which is only joined to the ſtirrup by this fourth bone.

BESIDES theſe bones, there are here ſeveral cavities and ducts.

THE firſt, is in its fore part neareſt the *membrana tympani*; and is the entry to the cells inthe *mammillary* proceſs.

THE

THE *maſtoide* cells are very irregular cavities in the ſubſtance of the maſtoide apophyſis, which communicate with each other, and have a common opening toward the inſide and a little above the poſterior edge of the orbicular groove. Theſe cells are lined with a fine membrane, which is partly a continuation of the *perioſteum* of the drum, and ſeems partly to be of a glandular ſtructure like a kind of pituitary membrane.

THE ſecond is the orifice of the *Euſtachian* tube, G, c, which leads to the palate: the beginning of this paſſage is very narrow and bony, the middle is cartilaginous, and its extremity, which opens near the *uvula*, is above $\frac{1}{3}$ inch wide, membranous, and dilated by ſome muſcular fibres; and they open the extremity of this paſſage, either when we open our mouths to hear more diſtinctly, or when there ſhould be a free communication between the external air, and that in the cavity of the *tympanum*.

Fig. 3, 5.

panum. The third and fourth are in the internal proceſs of the *Os petroſum.* The one is called the *feneſtra ovalis,* upon which the baſis of the ſtirrup ſtands, and is the entry to the *veſtibulum,* f: the other is called *feneſtra rotunda,* x, it is covered by a fine membrane, inchaſed in a riſt of this hole, and leads to the *cochlea.* Fig. 5.

THE *veſtibulum,* f, 4, is a cavity in the *Os petroſum,* behind the *feneſtra ovalis,* it is about $\frac{1}{6}$ inch broad, as long, and $\frac{1}{7}$ inch high. The ſemicircular pipes of the labyrinth open in it, the upper turning of the *cochlea,* and auditory nerve, at five ſmall holes. Fig. 4, 5.

THE labyrinth is made of three ſemicircular pipes, *e,* 1, 2, 3, about $\frac{1}{20}$ inch wide, excavated in the *Os petroſum*; they open in the *veſtibulum* by five orifices. The upper pipe is generally about $\frac{1}{2}$ inch long, and joins one of its extremities with one of the extremities of the inferior pipe, which Fig. 4, 5.

is above $\frac{1}{2}$ inch long, and theſe two extremities open by one orifice, but the middle pipe opens at each end by itſelf into the *veſtibulum*, and is above $\frac{1}{4}$ inch long.

Fig. 4, 5. THE *Cochlea*, *h*, 4, 5, is the laſt cavity of the ear, and reſembles a ſnail's ſhell: its canal, which winds in a ſpiral line, is divided into two, by a thin *lamina ſpiralis*; that part next the axis is bony, but very brittle, and that next the outer ſhell is membranous, appearing to be only made of the auditory nerve. The upper canal opens into the *tympanum*, and the lower into the *veſtibulum*.

THE veſſels of the internal ear are arteries and veins, from the internal carotidale and jugulars. The auditory nerve, enters by the hole in the internal proceſs of the *Os petroſum*. It conſiſts of two bundles, one of which is hard, and the other ſoft. Five branches of the *portio mollis* enter the *veſtibulum*, and form

PLATE XV.

FIG. I.



FIG. II.

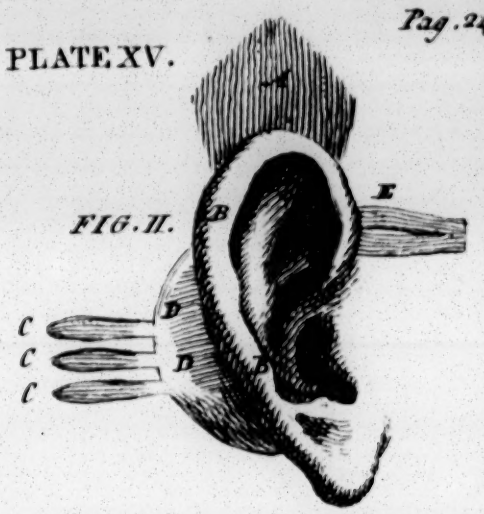


FIG. III.

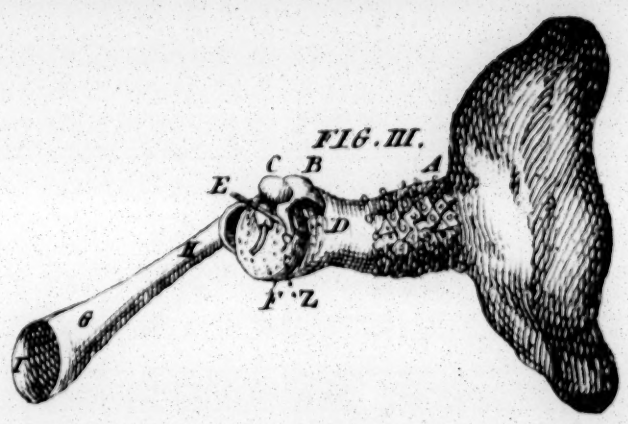
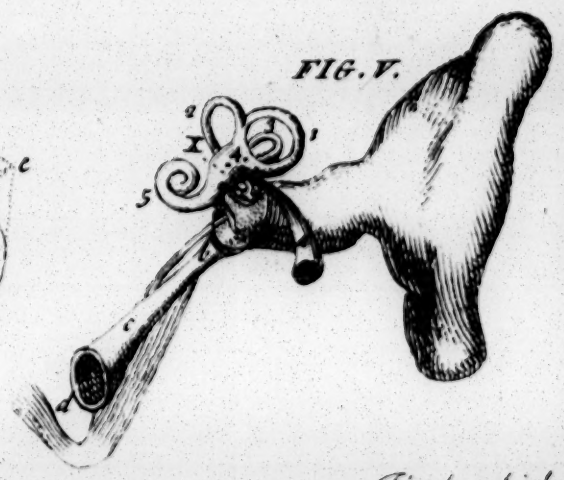


FIG. IV.



FIG. V.



Fiesch. sc Sculp.

form a delicate web, which ſends ſlips that run through the ſemicircular canals; and the reſt of the *portio mollis* enters the *cochlea* at the center of its baſis, and turns with the ſpiral line, of which it probably makes the membranous part. The *portio dura* paſſes through its proper paſſage, to be diſtributed among the external parts about the ear.

SECT. XVI.

Shewing the Uſe of the Parts of the EAR.



FIRST I conſider, with the late learned M. du *Verney*, the external ear as a horn, whoſe fine poliſhed cavity ſerves to collect the ſound, and make its impreſſion ſtronger on the other parts of the ear. We ſee when the external ear is cut quite off, that the hearing is much impaired, and often entirely loſt; and people thus afflicted are forced to uſe an air trumpet, or ſuch like inſtrument to ſupply that defect: and this is the reaſon, why brutes, as deer and hares, turn their ears toward that ſide the noiſe comes from, when they would hear. Some ſay that the directions of the ſound, inſinuating themſelves between the foldings of the ear,

ear, make there many reflections before they come to the *concha*, ſo that theſe foldings and reflections being repeated, ſerve to increaſe the impreſſion on the other organs; as in a ſemicircular vault, the rays of the ſound, reflecting at equal angles along the circumference of the vault, paſs from one end to the other by ſeveral great and ſmall reflections.

THE motion of the muſcles of the external ear is ſcarce perceptible, if any at all; it ſeems that their action is to contract or relax the *concha* in proportion to the tremulous motion of the air.

BY means of the obliquity of the auditory paſſage, the membrane of the *tympanum* is defended from the injuries of the air, the ſurfaces of the conduit enlarged, alſo reflections are more often repeated, whereby the impreſſions are made ſtronger.

THE wax found in the *meatus* hinders duſt and inſects from entring the ear; yet if this glutinous humour was ſuffered to increaſe in the ear, it would ſoon grow thick, and ſtop the vibrations of the air from approaching the membrane of the *tympanum* *.

THE cylindro-elliptic figure of the auditory paſſage, aſcending and deſcending, and again aſcending in a ſerpentine progreſs, makes all the rays unite in the centre of that end the drum is placed in, by which the ſound is increaſed, and at the ſame time its clangor hindred.

THE three branches of the three different pair of nerves, that diſtribute themſelves

* M. du *Verney* in examining the cauſe of deafneſs, found in the *meatus auditorius*, about $\frac{1}{6}$ inch diſtant from the membrane of the *tympanum*, a pellicle pretty thick, before which there had gathered a conſiderable quantity of dry matter. This he thought to be often the common cauſe of deafneſs.

themſelves on the cartilaginous conduit, are the cauſe of the ſenſibility found in this part, which informs the animal of the moſt minute body that enters the cavity of the ear.

THE membrane of the *tympanum* is the firſt part of the internal ear that preſents it ſelf to our view; ſome affirm that it is of little or no ſervice to hearing; for, ſay they, deaf people, by taking the handle of an inſtrument in their teeth, can hear the ſound of any thing; yet it is of ſo great conſequence, when once torn or pierced in any animal, that its hearing is for ſometime afterward preſerved, but it quickly grows weak, and is ſoon quite loſt.

THIS membrane is bent and ſlackened by three ſmall muſcles tied to the *malleus*, which is faſtned behind this membrane: the external muſcle ſlackens it by putting it in a ſtraight plane,

the internal, ſituated on the ſurface of the *Os petroſum*, draws it within, and conſequently ſtretches it more than when it is in its natural poſition. The extenſion of the *tympanum* is made when the two muſcles act together, but the relaxation is only made by the action of the external muſcle; and the reaſon for it is, that the inſertion of the external muſcle, which is oppoſite to the other, being nearer the head of the hammer, and the inſertion of the internal muſcle being a little nearer the extremity of the *malleus*, the force of the traction of the internal muſcle is increaſed by the traction of the external.

FROM what has been ſaid, it is plain, that theſe little muſcles act, but the chief difficulty is to know what makes them act, and what determines them to contract and relax the membrane of the *tympanum*, when it is to receive the different impreſſions of different ſounds. Is it the will that makes them

them act? there is little or no appearance of it, for a ſound often ſurprizes us when it happens unexpected; I think it is the objects, that determine theſe muſcles to contract or relax the membrane of the drum, according to the different impreſſions.

THE *tympanum* receives the different concuſſions of the air, and then communicates them to the other parts of the internal ear.

THERE is reaſon to believe that the air, collected in the cavity of the *tympanum*, being ſhaken by the vibrations of the membrane, contributes to communicate them to the immediate organ; but it does not appear that this ſmall quantity of air in motion has ſufficient force to move the *Os petroſum*, or rather the labyrinth: it is therefore highly probable that the vibrations of the drum are communicated to the *malleus*, the hammer communicates them to the anvil, and the anvil to the

the ſtirrup, whoſe motion at leaſt moves the *Os petroſum* and the labyrinth; as the air, between two lutes laid on the ſame table, is not capable of communicating entirely the vibration of the cord of one to that of the other, but the cord, that is ſtruck, makes firſt the wood of the lute to which it is tied tremble, the wood makes the table ſhake, the table, the wood of the ſecond lute, and this moves the cord, which is faſtned to it, and which agrees with the other: this is ſo true, that if we take either of thoſe lutes, and hold them in the air, the experiment will not ſucceed.

THE nature, the mechaniſm and articulation of theſe three little bones ſeem to favour very much this conjecture; they are dry, hard and ſlender, conſequently capable of being moved; the handle of the hammer is in its full length fixed to the drum: it is plain then that it cannot be moved without

out communicating its motions ſucceſſively to the other bones, ſince they are articulated with each other, and their articulation without cartilages greatly facilitates this communication of motion.

IT is hard to determine the uſe of the muſcle of the ſtirrup, we may ſuppoſe that in drawing out a little the baſis of the ſtirrup, which is immediately applied upon the *feneſtra ovalis*, it ſtretches more or leſs in proportion the thin membrane that covers the upper part of the baſis, and alſo renders it more capable of receiving the vibrations of the membrane of the drum, to communicate them to the *veſtibulum* and labyrinth. We may yet aſſert that in drawing the ſtirrup, which is very flexible, it in ſome meaſure ſtretches and keeps it in a firmer ſituation, and conſequently fits it the better to receive the motions of the hammer and anvil.

THERE

THERE are, as has been mentioned, two conduits at the ſides of the membrane of the drum, one terminating at the palate, the other is contained in the cavity of the maſtoide apophyſis. When the drum is drawn inward, the air, contained in the cavity of the drum, retires into theſe two conduits, and returns when the membrane is ſlackened, otherwiſe the motion of the drum would be ſtopped by the elaſticity and reſiſtance of the air, if it did not find an exit. There is reaſon to believe that the return of this air in the cavity of the *tympanum*, favours the reduction of the drum in its natural ſituation.

THE canal, going from the palate to the ear, furniſhes a freſh ſupply of air, to renew, from time to time, that contained in the cavity of the *tympanum*, and that the cold of the external air might not hurt the parts of the internal ear, the air, running through the cavity of the noſtrils, and along this canal to the cavity of the drum,

drum, receives the neceſſary and convenient modifications to the ſtate of thoſe parts that it goes to, without loſing its elaſtic force, which makes it fit for the uſes it is intended. Wherefore the air, that comes from the lungs, mixed with impure vapours, will not ſo eaſily enter this canal, the orifice whereof being ſo diſpoſed, as to give a freer paſſage to the air that enters the noſtrils, than that which comes from the lungs.

IT is a general opinion that ſome deaf people can hear the ſound of ſtringed inſtruments by means of this canal, and if their deafneſs be owing to the drum's ceaſing to act, we ought not to be ſurprized, if the vibration of the external air communicating, as it does, with that included in the cavity of the *tympanum*, that theſe perſons do hear the ſound of an inſtrument.

TO ſhew that the motion of the air, in the barrel of the drum, is not ſufficient

ſufficient to make deaf people hear the ſound of an inſtrument, we muſt obſerve that they are obliged to hold the handle of an inſtrument in their teeth, otherwiſe they would not hear at all, or at leaſt they would not hear ſo well. We may eaſily conceive that when the teeth are moved, the motion is communicated to the jaw-bones, next to the temple bones, and then to the bones of the ear; for they who are not deaf will hear the ſound of an inſtrument better and ſtronger, when they hold the handle in their teeth, and ſtop their ears. There are ſome deaf people, who hear better when we ſpeak to them above their heads; we think it probable that when the ſkull is moved in theſe perſons, the *Os petroſum*, and all the other parts are moved ſucceſſively.

HAVING ſaid that the *feneſtra ovalis* is ſhut up by the baſis of the ſtirrup, this dry and delicate bone, one of whoſe ſides is cover'd with a membrane, and whoſe baſis is very thin, having receiv-

ed

ed the motion of the two others, and of the air contained in the cavity of the *tympanum*, can eaſily communicate them to the *veſtibulum*, and to the air contained there, then to the *cochlea*, and, laſtly, to the three ſemicircular canals.

THE *feneſtra rotunda* is ſhut up by a membrane, reſembling almoſt the membrane of the drum; we may ſuppoſe that it receives the motion of the air contained in the cavity of the drum, and that it communicates itſelf to that air, contained in the inferior part of the *cochlea*, which being in that place very much preſſed, and having no exit, is capable of moving ſtrongly the ſpiral plate, and thus it is that the vibrations of the air approach the immediate organ of hearing, of which we are now going to treat.

THIS organ goes by the name of *labyrinth*, which being contained in the *Os petroſum*, conſiſts of two chief parts, *viz.*

viz. the *cochlea* and *veſtibulum*, with its three ſemicircular canals.

THE *cochlea* makes a part of the immediate organ; its compoſition is a convincing proof of this; for, firſt, the ſpiral plate, which makes the principal part, is hard, dry, thin, and brittle; theſe are very fit qualities for vibrations. 2. This plate lies not within the *ſemi-oval ſpiral* canal, but is ſtretched, adhering on one ſide to the nuel, and on the other a very fine membrane joining the ſurface of this canal, ſo that this ſituation of the ſpiral plate is ſo very favourable to the diſpoſition of being eaſily moved. 3. The ſpiral plate divides, by means of this membrane, the whole conduit of the ſpiral canal as into two flights of a ſtair-caſe, in the figure like a ſnail, built upon the ſame nuel, the upper of which has no communication with the under. The *feneſtra rotunda* opens into the lower, which has no communication with the upper flight, nor with the *veſtibulum*;

ſo

ſo the air ſhut up in the lower flight is moved both by the concuſſions of the *feneſtra ovalis*, and by the air contained in the upper flight of the ſemi-oval canal, which is alſo moved both by the motion of the air contained in the *veſtibulum* with which it communicates, as alſo by the air included in the inferior flight of this canal; the ſpiral plate being thus ſtruck at both ſides, its motion ought to be very ſtrong and ſenſible. 4. The ſpiral figure of this plate is an argument ſtrong enough to maintain what has been advanced, for in making twice and a half the circumference of the nuel, it receives the different vibrations of the air in many places; and this mechaniſm is obſerved in the tongue, the noſe, *&c.* 5. A conſiderable branch of the *portio mollis* of the auditory nerve, having reached the baſis of the *cochlea*, divides itſelf in many ſmall branches, which going through the little

holes that pierce the nuel, diſtribute and loſe themſelves in the ſeveral windings of this ſpiral plate.

IN ſhort this plate is not only capable of receiving the vibrations of the air, but its ſtructure ought to make us think that it can anſwer all the different characteriſtics; for being longer at the beginning of its firſt revolution than at the extremity of the laſt, where it terminates as in a point, and its other parts diminiſhing in proportion, we may aſſert that the larger parts being, as they can be, moved without the other, are only capable of the ſloweſt motions, which conſequently anſwer the low ſounds; and on the contrary the narrower parts being ſtruck, the ſtronger and quicker is their motion, and conſequently anſwer to the ſharp ſounds; in the ſame manner that the largeſt parts of a ſpring of ſteel make motions ſlower, and anſwer to the ſlow ſounds, and the ſtreighteſt of them make quicker,

quicker, and conſequently anſwer to the ſharp ſounds.

SOME ſay that the *veſtibulum* and three ſemicircular canals only ſerve to increaſe the motion of the air, others to leſſen it; I think they make up a part of the immediate organ, for the following reaſons.

Firſt, BIRDS, have only three crooked conduits in form of a ſemicircle, and a fourth which is ſtraight and ſhut at one end, but opens with the reſt in a cavity common to them, and is in lieu of a *veſtibulum*. Fiſh have likewiſe theſe three canals, but the former nor the latter have no *cochlea*, yet both hear: hence it is plain that the ſemicircular canals are the immediate organ of hearing in birds and fiſh. Why then may not they be of the ſame uſe in man, ſince the ſtructure is the ſame in man as in theſe animals, at leaſt theſe ſemicircular canals

in man ought to make a part of the immediate organ? Therefore this organ is compoſed of two eſſential parts.

II. I doubt not but the *portio mollis* of the auditory nerve conveys the impreſſion of the ſound to the brain; now there are two branches of it which enter the cavity of the *veſtibulum*, and extend themſelves in threads and membranes that line theſe ſemicircular canals; whence we infer that this part of the labyrinth makes alſo a part of the immediate organ.

III. FROM the ſtructure of the *veſtibulum*, and the three ſemicircular canals, we may reaſonably think that the impreſſion of ſounds increaſes and fortifies itſelf in its way, and conſequently is more able to move the nerves which are there ſpread.

BY the communication of the *portio dura* of the auditory nerve, with the branches

branches of the fifth pair, which diſtribute themſelves to the parts that form the voice; we may explain the communication between hearing and ſpeech: it is thought that the vibration of the nerves of the ear communicates with the nerves of the fifth pair; which makes the ſpirits, that run from the brain into theſe nerves, which tend to thoſe parts that form the voice, ſo diſpoſe their muſcles, that anſwering the impreſſion the voice has made in the brain, they put them in ſuch a condition to form a voice equal to what has been heard. It is ſaid that this is the reaſon men and birds excite each other to ſing, and men born deaf are likewiſe dumb.

IT is alſo thought that it is by the communication of the ſecond vertebral pair with the external ear, that at the leaſt noiſe we turn our head, and the body finds it ſelf diſpoſed to make different motions, according as the ſound

is agreeable or diſagreeable: and as theſe nerves communicate with thoſe of the heart and lungs, it is owing to the former reaſon, that we find the ſame alteration in the pulſe and reſpiration.



A SHORT

METHOD

Of Diſcovering the

Virtues *of* Plants

IN

Curing the DISEASES

OF THE

Human Body.

INTRODUCTION.

AS the Almighty Creator has moſt liberally produc'd a wonderful plenty and variety of all things, ſo likewiſe has he wiſely ordain'd that each different ſpecies, to the end that they may be more eaſily known, ſhould appear ſtampt, as it were, with proper characteriſtics and peculiar marks. Great, and almoſt innumerable, is the multitude and variety of animals; ſome whereof have their habitations in water, others on land, and others are denizens both of the one and the other; and to every one of theſe are given proper marks or characters by which they may be eaſily diſtinguiſh'd from each other. It is moſt wonderful and worthy

of

of mature conſideration, that in the mineral kingdom, *metals* and *minerals* ſhould have a particular colour, figure and form, occaſioned by the places and ſubterraneous tracts from whence they are dug; ſo that one of a very ſmall acquaintance with theſe things, may, on ſeeing them, eaſily know in what bed they lay, or from what rock or quarry ſuch a piece of marble or ſlate was taken. For in all the kinds of metals, as *lead*, *copper*, *ſilver*, &c. we ſhall ſcarcely find one exactly reſemble another; and it is the ſame with regard to ſtones, as *marble*, *jaſper*, and other precious *gems*. But ſtill greater and more incredible is the plenty and variety of plants in the vegetable world; we may here plainly obſerve the footſteps of divine wiſdom, ſeeing that every plant, and each ſpecies thereof have ſome peculiar characteriſtic appropriated to them, by which they are diſtinguiſhable.

THE

THE perfection of this knowledge of *herbs* the ancients were intirely ignorant of, wherefore we need not wonder that each plant was called by this or that name, as fancy dictated; which arbitrary appellation has not only confuſed, but has been a great hindrance to a perfect knowledge of *botany*.

AND, as in our preſent age, we ſee almoſt all arts and ſciences have received vaſt additions and improvements; we have alſo the pleaſure of ſeeing the ſtudy of *botany*, which was formerly very much neglected, now brought to a great degree of perfection, by the ſtudious application of many learned men of divers countries, who have laborioufly endeavoured to remove the difficulties, and demonſtratively to lay the foundation of the *botanic* ſtudy, by reducing the ſeveral kinds and ſpecies to certain claſſes, that have peculiar characters and ſignatures whereby they may be certainly known; by means whereof the ſtudy of *plants* and *herbs* is become exceedingly plain,

plain, ſhort, pleaſant, and certain, which formerly was not only difficult, but almoſt impoſſible, for want of ſuch a regulation. Some of the moſt noted and deſerving improvers were *Cæſalpinus* and *Fabius Columna*, both *Italians*; of our own country were *Moriſon* and *Ray*; among the *Germans*, *Hermannus*, *Amannus*, and *Rivinus*; of the *French* was *Tournefort*. Theſe great men differ in their ſentiments; ſome lay for the foundation of this ſcience the little ſeed-bags or veſſels, and the figure and ſtate thereof; others think that their diſtinction is more conſpicuous from the figure of the flowers, and ſhape of the leaves; they ſeem indeed to come neareſt the truth, who aſſert that one mark is not ſufficient, but that there are many to be examined, before we can come to a true knowledge thereof; ſo that the whole habit and form, not only the ſeed-bags and flowers, but the leaves and roots, muſt be inquired into.

ALTHO'

ALTHO' we have ſeen ſo great a progreſs made in this branch of learning, yet it is ſtrange that ſome have not hit on a method, whereby we might ſearch out the ſpecific virtue of each herb, which is far more profitable than to acquaint us with their different kinds, and names; and although ſome have labour'd in this work not without praiſe, whilſt they affirm that the knowledge of their efficacy is to be found out partly by their characteriſtic, and partly by their taſte and ſmell, yet we intend not only to ſupport that opinion, but propoſe a certain method of forming a right judgment concerning their virtues.



SECT.

SECT. I.

To diſcover the Virtues *of* Plants *from their external* Marks *and* Characteriſtics.

IT is not chance only that leads us to the diſcovery of *plants*, but they, who apply themſelves that way, obſerve that every plant ariſes from its ſeed, and is confined in miniature as in an egg, after the ſame manner as animals. The earth becomes a matrix to the ſeed, it ſoftens and extends the bark, opens the pores, and by a nitrous fluid it is penetrated, and unſheathed from the huſk, ſo that the parts of the little plant are ſtretched, that were before wound up together confuſedly, and then this ſmall plant begins to appear on the ſurface of the earth, and the nutritious juice

or

or ſap circulates in the fibres that do the office of the veins, arteries, and nerves. They dilate, extend, and grow to a certain determinate ſize, limited and appointed by the great author of nature.

A plant draws its principal nutrition by the root, becauſe the pores thereof are better diſpoſed than others for receiving the juice from the earth. It is remarkable, that if the root of a ſmall plant is continued in the ſeed, it is to be met with at the top, and the ſtalk at the bottom, as it often happens that the juice which enters by the root, and which is driven in by the heat of the ſun, makes a half turn from the ſtalk, and mounts upward according to its determinate end. This juice, in circulating in the veſſels of the plant, purifies it ſelf, is rarified, exalted, and brought to perfection, in like manner as the chyle and the blood acquire their perfection by circulation. Then the more exalted and ſpirituous

parts

parts of the juice, which may be called the animal ſpirits of the plant, are employed upon flowers and fruits; the leſs ſubtle parts ſupply nouriſhment for the ſtalk, the branches, and the leaves; the groſſer parts ſtill congeal or coagulate into gums, roſins, and balſams; thoſe, that are the groſſeſt, produce an external bark, moſs, and ſeveral excreſcences. Though all plants receive their nutrition from one and the ſame ſpring, yet every one of them acquire different qualities, occaſioned from the diverſity of fermentations, and other natural elaborations produced by the texture or diſpoſition of their different fibres.

We aſſert that plants of a like characteriſtic have often a like force; as *cinnamon*, *caſſia*, *malabathrum* and *camphor-trees* have the ſame characteriſtic, and almoſt the ſame force. *Ginger*, *zedoary*, both ſorts of *galingal*, *Indian-cane*, *Arabian-coſtus*, and *zerumbeth* of *Garcias de Orta* have like characteriſtics, and

and are of equal virtue, for by their large quantity of acrimonious ſalt, they incide viſcid and groſs humours, attenuate, and conduce wonderfully in freeing the adjacent parts from obſtructions in long diſeaſes, and in removing all crudities even in the firſt paſſages.

ALL *fungi*, as *agaric*, *boleti*, *lycoperda* and *fungoides*, are known by the ſame characteriſtics, and are, by their certain virulent and ſubtile acrimony, very pernicious to the ſolids and fluids of the body, nor is it ſafe to uſe them internally.

ALL *moſſes*, and thoſe of the ſame quality, as *liver-wort*, *wolf's-claw*, *horſe-tail*, *moon-wort*, *oſmund*, and *adder's-tongue*, have the ſame characteriſtics, and their virtues are very much alike, as appears from their drying and aſtringent quality.

THERE are ſome plants whoſe ſeed is on the back ſide of the leaf, of which are the *male* and *female fern*, *harts-tongue*, *maiden-hair*, *wall-rue*, *polypody*; all which have a ſplenetic force, gently ſtrengthening the weakened tone of the bowels, and eſpecially the ſpleen or melt.

SPOTTED *lung-wort*, *gromwel*, *hounds-tongue*, *alkanet*, *borage*, and the *greater comfrey*, after their monopetalous flower, produce four naked ſeeds, which on account of the earthy particles, wherewith they abound, are ſtored with a glutinous and aſtringent quality, of great ſervice in conſolidating and healing wounds.

THERE are ſome plants, after their monopetalous flower, carry their ſeed in the form of a little cheeſe, as *marſh-mallows*, which being filled with a glutinous juice, are ſerviceable in all complaints ariſing from ſharp humours.

PELLI-

PELLITORY of the wall, blite, brache, gooſe-foot, mercury and *ſpinage* are all filled with a nutritious juice of the ſame ſort; hence they are of great ſervice in relaxing the bowels, and mitigating acrimonious humours.

VERTICILLATE plants, whoſe monopetalous flower is irregular, are plentifully ſtored with an oily volatile ſalt. Among which plants are *balm, mint, wild-marjoram, ſweet-marjoram, wild-thyme, roſemary, foreign marjoram, hyſſop, germander, ground-pine, lavender, ſage, cat-mint, horehound,* which among all the cephalic and nerve-ſtrengthening herbs juſtly claim the precedence.

THE next are thoſe call'd *umbelliferous* plants, which after their flower, carry double naked ſeeds, among whom are *caraway, angelica, lovage, chervil, wild-carrot, maſter-wort, ſmallage, dill, coriander, aniſe, parſnips*; all which abound with a ſubtile and vola-

tile oil, of an aſſuaging quality, whereby they are very powerful in diſcuſſing wind and groſs humours.

LASTLY, nature produces plants, whoſe capſula is divided into three parts after the regular hexapetalous flower; as *garlick*, *onions*, and *aſphodel*, which, according to their operations, produce two principles, whereof one is a thin, ſharp ſulphureous, the other a ſweet, glutinous juice: by reaſon of the former, they ſtrongly ſtimulate all groſs matter, expel urine and ſweat, and promote the circulation of the blood; but if the ſalt in boiling be waſted, a glutinous juice remains behind, which ſoftens hard tumors, and brings impoſthumes to ſuppuration.

COMPOUNDS of regular flowers, having a volatile ſulphur, and a bitter ſalt, are very ſerviceable in provoking the *menſes*, and in deſtroying worms, as *tanſey*, *ſouthernwood*, *mug-wort*, *mint*, creeping *birth-wort*. Some *ſemifloſculets*, as

as *dandelion*, *viper-graſs*, *endive*, *ſuccory*, *gum-cichory* abound with a milky juice, and an abſterſive ſalt.

TREES, as *fir*, *pine*, *larch-tree*, *cypreſs*, *arbor vitæ*, *cedar of Libanus*, *roſin-tree*, *balſam of Tolu*, have their fruit taper, and bear imperfect flowers: each of theſe have a reſinous juice, from which is diſtill'd a thin, balſamic oil, of a very warm nature, diuretic, and of great ſervice in long and cold diſeaſes, by ſtrengthening weak fibres, and attenuating viſcid humours.

BUT excluſive of this way, whereby we come to know the virtues of plants from their external marks and characteriſtics, we will attempt a more compendious method, by the taſte and ſmell, of finding out the moſt efficacious virtues of plants in removing diſeaſes.

SECT. II.

To diſcover the Virtues *of* Plants *from their* Taſte *and* Smell.

THE two moſt efficacious principles in all mixt bodies are ſalt and ſulphur, as is ſufficiently known to every one, who has the leaſt acquaintance with phyſick or chemiſtry; the former is beſt judged of by the taſte, and the latter from the ſmell; yea, though there be a different mixture of parts whereby the taſte and ſmell differ very much on many occaſions, yet ſome laws may be laid down, whereby from the taſte and ſmell we may form a certain judgment of the ſtrength of plants.

I. ALL bitter plants, as *wormwood*, *birth-wort*, the leſſer *centaury*, *carduus benedictus*, *carduus Mariæ*, *germander*,

der, *fumitory*, *wood-ſorrel*, *tanſy*, *chamomile flowers*, *ſuccory-root*, *rhubarb*, *aloes*, *china* of *china*, the extract of *colocyſtus*, on account of their ſalt which is fixt-alkaline, earthy, mixt with ſulphur, are aperient, inciding, and of great ſervice in blunting the acids, breaking the coheſion of viſcid matter, and by a gentle *ſtimulus* are ſerviceable, not only in diſcharging obſtructions of the inteſtines, but in helping excretions of every kind; hence they keep the belly lax, and facilitate perſpiration. They are of great uſe in curing a cachexy, the ſcurvey, dropſy, jaundice, ſtoppage of the *menſes*, the hyppo, quartan and other intermitting fevers, a bad ſtomach, the loſs of appetite, and infractions of the *viſcera*.

II. PLANTS of a ſharp taſte and a ſtrong volatile ſmell, when diſtilled, have an antiſcorbutic power, they very much promote the circulation of the blood, provoke the *menſes*; and in ſcorbutic cauſes, ulcers, tumors, a ca-

chexy, defects of the ſtomach ariſing from viſcous acid crudities, are of great efficacy. To this claſs belong the *cuckow-pint-root*, *ſweet-cane*, *brook-lime*, *ſcurvey-graſs*, *marſh-mary-gold*, *rocket*, *water-creſſes*, *husky-creſſes*, *dittander*, the leſſer *houſe-leek*, *arſmart*, *groundſel*, *pepper*, *muſtard*, *garlick*, *onions*, *calamus aromaticus*, *horſe-radiſh*.

III. AROMATIC plants abounding with a fine pleaſant oil, are very powerful in helping the nerves, and ſtrengthening the whole ſyſtem; therefore in all diſeaſes ariſing from imbecillity, and a lax tone of the nervous parts, as for inſtance, the palſy, apoplexy, epilepſy, rheumatiſm, and in diſorders of the ſtomach and womb, in pains of the head and other parts, and in ſubduing mortifications of the external members, in diſcuſſing tumors, alſo in ſtopping fluxes, they are of great uſe. Of this number are *ſouthernwood*, *mint*, *baum*, *roſemary*, *marjoram*, *Cretan origany*, *ſweet-cane*, *lavender-flowers*, *Roman-*

man-chamomile flowers; the aromatics are *cloves*, *mace*, *nutmegs*, *cubebs*, *cinnamon*, *cardamoms*, *coriander*, *Guinea-pepper*.

IV. PLANTS of a ſharp, oily, terebinthinous-aromatic taſte have a diuretic, cephalic, and ſtrengthening quality, and are good in all obſtructions of the reins, whether from ſand, or any mucous adheſions; they are alſo a great vulnerary in gonorrhœas and the whites; among which are the *golden-rod*, *balſam*, *Jeruſalem-oak*, *ſavin*, *ground-pine*, *germander*, *leaves* and *flowers* of St. *John's-wort*, *Robert* of the *wall*, *leaves* and *berries* of *bay* and *juniper*, *valerian-root*, *ſnake-root*, *Virginian-root*, *ſpikenard*, *pine*, *fir*, *maſtick*, *male-frankincenſe*, *balſam* of *Peru*, *turpentine* and its oil.

V. BITTER and aromatic plants manifeſt a ſtrengthening and carminative quality; and in weakneſſes of the ſtomach and inteſtines, in cachexies, inter-

intermitting fevers, and weak digeſtions, they are very ſerviceable. In ſuch caſes *cortex-peru*, *citron-peel*, *orange-peel*, *winter-bark*, *ſaſſafras*, *zedoary*, *galangal*, *calamus aromaticus*, *cubebs*, *cardamoms*, *Roman-chamomile flowers* excel.

VI. PLANTS of an earthy, bitter and ſubaſtringent taſte, indicate a corroborating and vulnerary quality, which is good in ſtopping fluxes, and reſtraining fits of a fever; the chief of theſe are, the *cortex peru*, *aſh-bark*, *tamarisk*, *caper-bark*, *ſtagg's-tongue*, *maidenhair*, *ſcabious*, *germander*, *tormentil*, *lung-wort*, *bugle*, *dead nettle*, *leaves of ſpleen-wort*, *tea*, *fluellin*, which we experimentally find very ſerviceable in diarrhœas, cachexies, ſcurvey, defects of the ſpleen, and intermitting fevers.

VII. PLANTS, whoſe aſtringent taſte ſhows the earthly element to be ſomewhat acid, have an aſtringent quality, and are of great ſervice in ſtopping

ping fluxes of various kinds, and abating the violence of fevers; they are alſo of great uſe in weakneſſes of the reins, eſpecially in calculous caſes. Theſe plants in eſteem are, *tormentil*, *birthwort*, *plantain-root*, *oak*, *bark* of the root of *Egyptian-thorn*, *bark of pomegranate*, *hips*, *ſorrel*, *cinque-foil*, *ſtrawberries*, *horſe-tail*, *arſmart*, *flowers* of the *greater wild pomegranate-tree*, fruit of the *Egyptian thorn*, *medlars*, *unripe grapes*, the ſeeds of the *wolf's-claw*.

VIII. PLANTS, where the acid is predominant, are cooling, quench thirſt, and incraſſating, and alſo in fevers where the bilious humours abound, they are found of peculiar ſervice; of this claſs are *wood-ſorrel*, *juice of lemons*, *citrons*, *oranges*, *barberries*, *red gooſeberries*, *pomegranates*, *cherries*, *tamarinds*, *tart apples*, *unripe grapes*.

IX. PLANTS, which are not ſo exquiſitely ſharp, but abound with parts aque-

aqueous, mucilaginous, and a little reliſhing, are outwardly a little emollient, but inwardly temperate, and moderate, ſharp humours, inflammatory ulcers of the jaws; in teneſmus's, ſtranguries, ulcers of the anus, gonorrhœas, *&c.* they are given with great ſucceſs; of this principle are the ſeeds of *poppies*, *fleabane*, *fenugreek*, *linſeed*, *ſeed of quinces*, and the *four cold ſeeds*; to theſe belong *marſh-mallow*, *lilly*, *comfry* and *ox-tongue roots*, *mallow*, *borrage*, *pellitory*, *violet* and *purſlain leaves*, *ſweet almonds*, *gum-arabic*, *cherry-tree gum*, *gum tragacanth*.

X. In the compoſition of all which, beſides a mucilaginous ſubſtance, there is an oily, ſulphureous and volatile principle, as we ſee in *mullein*, *chamomile*, *melilot*, *yarrow*, *elder*, *ſaffron*, *white lilly flowers*. Theſe are good to ſoften hard tumours, and eaſe ſharp pains.

XI. Plants of a ſweet taſte, indicate that they are well tempered with

a mucilaginous ſulphur, and therefore are fitly adapted to thoſe diſeaſes, which proceed from ſalt and ſharp humours, as a cough and catarrh, diſorders of the breaſt, itch, leproſy, ſtone and ſtrangury. In this claſs are *liquoriſe-roots*, *figs*, *jujebs*, *ſebeſtens*, *dates*, *raiſins*, *tamarinds*, *ſweet prunes*, *honey*, *ſugar*, *anniſeed*, *fennel-ſeed*.

XII. PLANTS of a ſharp bitteriſh taſte have a bezoardic and alexipharmic quality, for by ſtimulating the fibres they accelerate the motion of the blood, and provoke ſweat; hence they are of great uſe in malignant diſtempers; ſuch are *contrayerva*, *dittany*, *gentian*, *maſter-wort*, *butter-burr*, *angelica*, *carline-thiſtle*, *Virginian ſnake-root*, *ſarſaparil*, *zedoary*, *valerian roots*, *ſcordium*, *germander*, *ground-pine*, *carduus benedictus*, *ſcabious*, *elecampane*, *leſſer centaury*, *rue*, *juniper-wood*, *guajacum* and its bark, *citrons* and *orange-peels*.

THE

THE taſte gives the ſmell, becauſe it renders ſenſible the volatile ſulphureous parts, which greatly contributes to the finding out the ſalutary force of plants: for we experimentally know that plants, of a rank and diſagreeable ſmell, fill the head with vapours, eaſe pain, dull and ſtupify the mind and ſenſes. In which number we reckon all kinds of *poppies*, *night-ſhade*, *thorn-apple*, *tobacco*, *white lillies*, *peony*, *darnel*, *mandrake* and *ſaffron*. There are other plants, of a grateful fragrant ſmell, occaſion'd by the balſamic ſulphur, by which they reſtrain the violence of the nervous fluid, are ſucceſsful in moderating convulſive ſpaſms of the nervous parts, and relaxing the nerves when criſp, are called reſtoratives; among which are the flowers of *roſes*, *white lillies*, *primroſes*, *lime-tree*, *jeſſamine*, *Egyptian thorn*, *meadow-ſweet*, *baſtard dittany*, *orange*, *citron*, *lillies* of the *valley*, *clary*, *ſage*.

SOME

SOME ſeeds when bruiſed exhibit, by diſtillation, a water of a pleaſant ſmell, which has a reſtorative and anodyne virtue; ſuch are the kernels of *peaches*, *prunes*, *cherries*, *apricocks*, bitter *almonds*, and more of this kind.



SECT.

SECT. III.

To diſcover the Virtues *of* Plants *from the nature of their* Soil *in which they grow.*

HAVING ſhewn how to know the virtues of plants from their external marks and characters, as alſo from their taſte and ſmell, we will attempt another method to come at their virtues; which is, by carefully conſidering the nature of the ſoil, in which every plant in particular flouriſhes, and grows ſpontaneouſly. We are taught by experience that all plants will not grow alike in the ſame ground, but ſome proſper better in one ſoil, ſome in another: it is plain that a fruitful ſoil agrees not

not with ſome trees, they riſe to their accuſtomed growth but with difficulty, which is manifeſt from the *yew*, the *pine*, the *fir*, *mirtle*, *wolf's-claw*, *horſe-tail*, all which grow beſt in a barren ſoil: ſome being tranſplanted into another ſoil, change their nature very much, and, as it were, degenerate from their native qualities: *marſh-parſley* is very acrimonious, but it becomes mild when tranſplanted into a fatter ſoil. *Fenny crow-feet* have a cauſtic quality, but thoſe which grow in meadows and on mountains have, for the moſt part, very little acrimony; the leſſer *mountain tormentil* increaſes much greater in marſhy places; alſo *maiden-hair*, the *male* and *female fern*, which in marſhy places grow almoſt to a man's height; *plantain*, *mother of thyme*, *primroſes*, flouriſh better near the water, than in dry and mountainous places, yet their fragrancy in fenny places is much greater. Grain, as *rye*, *wheat*, *barley*, in high places are covered with

a thin rind, and yield greater plenty of corn, and by fermentation much ſtronger ſpirits. No doubt but *butter*, *milk*, *cheeſe* and *honey* are much better in high than in low places; likewiſe *wool* is much finer in mountainous and cold places, than in thoſe that are lower and more temperate. It is a common remark that the beſt *wine* is made of the grapes that grow near the *Rhine*, yet there is a great difference in reſpect of its goodneſs and ſtrength, and that intirely depends on the different ſoils: hence it appears that although vines be planted in the ſame altitude, and have the ſame advantage of the ſun, be of the ſame ſpecies, and have the ſame culture, yet after all this, they produce different ſorts of *wines*, which is plain in *Hockheim*, *Koſthem*, and *Caſſel*, being neighbouring places, yet produce excellent *wine*, but not of the ſame virtue and ſtrength. In ſaltiſh places, and thoſe near the ſea, there are plants that put forth ſpon-

ſpontaneouſly, but when tranſplanted, do not ſo much as bud, as *graſs-wort*, *ſea ſcurvy-graſs*, *ſea-onion*, *bind-weed*, *herb ſpurge*, *ſea-ſpury* and *ſea-orach*.

A DRY and ſandy ground liberally nouriſhes ſuch trees, as the *pine*, *fir*, *pitch-tree*, *juniper*, *yew*, *ſweet broom*, *ſaxifrage*, *yellow ſtuados*, *ground-pine* and *wild bugloſs*.

IN ſtony places grow *carline thiſtle*, *pulſatillum*, *black-hellebore*, *bupleuron* and *germander*.

IN dry and muddy places proſper *pulſe*, as *peaſe*, *beans*, *lentils* and *vetches*. In the vallies and ſandy ground grow *ſanicle*, *lung-wort*, *liver-wort*, *wild ſpikenard*, *periwinkle*, *winter-cherry* and *ſpurge laurel*. About ſhady hedges frequently grow *violets*, *chickweed* and *pile-wort*. Near rivulets, where the waters are clear,

grow *butter-burr*, a ſpecies of *radiſh*, *brook-lime*, *water-creſſes* and *burnet*.

We find from the experiments of *Boyle* and *Helmont*, that *plants* receive their increaſe and growth from earth and rain-water, and that earth is the chief foundation of the compoſition both of animals and vegetables, and is the original of ſalt and ſulphur, as diſtillations, calcinations, reſolutions and chemical experiments evince. He ſeems to come beſt at the knowledge and virtue of *plants*, who enquires into the ſpecific and peculiar nature of every ſoil, eſpecially when we ſee in the ſame ſeed, ſown at the ſame time in different ſoils, cultivated after the ſame manner, a wide difference of its increaſe, fruit, and time of coming to maturity. To confirm and eſtabliſh our aſſertion, we will ſhew this method by ſome clear proof, whereby we may ſearch out the ſpecific virtue of plants from the difference of their ſoil; not

that

that we intend by this to infer that the way we have already eſtabliſhed is not certain, but only to recommend all kinds of enquiry on this ſubject. We obſerve in marſhy places and where waters ſtagnate and corrupt, that many *plants*, which grow there, have a virulent, cauſtic quality, which outwardly inflames and raiſes bliſters, but being inwardly taken, purges, vomits, is diuretic and vermifuge, by which they are hurtful to cattle if they feed largely on them; of this kind are *wake-robin*, *ſmallage*, *chick-weed*, *helmet-flower*, *ſea-aloes*, *bitter-apple*, *briony*, *hemlock*, *ſow-bread*, *dragon-wort*, *ſpurge*, *horſe-tail*, *water-pepper*, *hyſſop*, *hore-hound*, *ſun-dew*, *ſena*, *bind-weed*, *black alder*, *ginger*, *water-flower-de-luce*, *agrimony*, and many more of the like kind, whoſe virtue chiefly conſiſts in a ſharp cauſtic ſalt, which, when got into the nervous fibres, gnaws and tears them, and provokes convulſions, and unruly and immode-

rate motions in animals. I will allow that cauſtic plants may be found in ſome other places beſides fenny ones, as *ſpurge*, *paſque flower*, *black* and *white hellebore*, which grow in high and dry places; yet we may enquire whether there is not in theſe high places putrified and moiſt earth, that nouriſhes this venemous quality in theſe plants. It may be objected that fenny and moiſt ground produces cooling plants, ſweet and nouriſhing ſeeds, and fruits, as *rice*, *water caltrops*, *lilly flowers*, *water plantane*, &c. but though all theſe be true, yet if we touch their roots with the tongue, we ſhall perceive that they taſte very ſharp.

For example, all *fungi* have ſomething poiſonous in them, which is ſtronger in ſome than in others. Now every one knows that the *fungi* ariſe from the nutricious juice of trees, which ſweats in great plenty, and is pu-

putrified by great heat, and alſo from putrified *plants* and rotten dunghills; and, as in autumn, when the air is moiſter, ſo the corruption of *plants* is the greater, therefore at that ſeaſon, the *fungi* are more plentiful.

THE reaſon why mariſhy places and ſtagnating waters are liable to produce poiſonous *plants*, is becauſe all putrefaction is the mother of ſalt and ſulphureous particles, of which ſtinks and ungrateful taſtes are inſeparable companions; therefore water being, for ſome time, ſtagnated, begins by the heat of the ſun to putrify, from whence ariſe ſteams which are very pernicious to health, ſo it is no wonder if the parts of the ſame corrupted earth, when communicated to the ſubſtance of the *plant*, ſhould produce an effect no more healthy than thoſe ſteams.

HENCE a more careful obſervation, both concerning botany and phyſical practice, will be requiſite, *viz.* that plants expoſed to wind and rain, and growing on high places, ſeem above all others, to be beſt accommodated for phyſical uſes, and many of them have the firſt place, with reſpect to their aſſiſtance in chronic diſeaſes; among which are *ſouthernwood*, *agrimony*, *birth-wort*, *ladies mantle*, *mug-wort*, *arnica*, *fir*, *pine*, *betony*, *daiſy*, *caroline thiſtle*, *ground-pine*, *germander*, *mountain calamint*, *wild baſil*, *ſuccory*, the *leſſer centaury*, *baſtard dittany*, *leopard's-bane*, *wild carrot*, *maudlin*, *broom*, St. *John's-wort*, *hyſſop*, *juniper*, *feaverfew*, *wild marjoram*, *horehound*, *cinquefoil*, *lung-wort*, *burnet*, the *leſſer mouſe-ear*, *pellitory*, *wild thyme*, *wall-ſage*, *hemlock*, *ſcabious*, *devil's-bit*, *ſanicle*, *hart-wort*, *viper-graſs*, *citron*, *ſtachas*, *thyme*, *tormentil*, *winter-green*, *milk-wort*, *golden-rod*, *ſwallow-wort*, Paul's-

betony

betony and *vervain.* All theſe plants, though not of alike force, yet they are near a kin, becauſe each of theſe, on account of their origin, are temperated and endowed with a balſamic quality, ſomewhat bitter and coroborating, ſo that they ſtrengthen and ſupport the ſolid parts, and the relaxed fibres of the body, and give a freer circulation to the blood and humours, by which the obſtructions of the excretory veſſels are opened, ſecretions and excretions rendred more ſpeedy, whence it is ſuppoſed that theſe *plants* have a great power not only to aſſiſt weakneſſes, but entirely to remove them.

YET there are *plants* of more efficacious virtues, which the earth, when fattened and manured, ſpontaneouſly produces and nouriſhes: for they, on account of the principal ſalt and ſulphur, have an anodyne quality, and a ſoporiferous and narcotic virtue, therefore being given with caution,

are

are of great uſe in ſubduing acrimonious humours, and relaxing the too tenſe ſolids. Thus we ſee that fat and fertile ground produces *aniſe*, *dill*, *fennel*, *brook-lime*, *ox-tongue*, *hound's-tongue*, *chervil*, *ſaffron*, *coriander*, *dwarf elder*, *fenugreek*, *henbane*, *clary*, *lovage*, *hops*, *melilot*, *lillies*, *mandrake*, *tobacco*, all ſorts of *poppies*, *night-ſhade*, *thorn-apple*, *wall-flower*, *poplar*, *elder*, *herb true-love* *ſoap-wort*, *valerian*, *mullen*, *meadow-ſweet*. He who is but a little acquainted with botany may eaſily ſee that the efficacy of theſe *herbs* is much alike, on account of their ſulphureous, fat and viſcid principle; which is the reaſon that they have the greateſt power in temperating the acrimony of the ſalts, in reſtraining the immoderate motions, in appeaſing pain, and mollifying tumours; where ſulphureous ſoils have a certain nitrous ſalt hid in them, they, for the moſt part, ſend forth the ſame ſalt;

and

and we ſee theſe places produce *mercury*, *pellitory*, *nettles* and *ſpinage*, which have a nitrous, abſtergent juice. We know that fat and well dung'd fields plentifully produce various ſorts of *darnels*, or *tares*, of a narcotic virtue.



INDEX.

INDEX.

ÆTHER, its properties, from Sir *Iſ. Newton* Page 143
Almonds of the Ears 177
Ancle-bone 98
Aqueous humour of the eye 204
Articulations of bones 10
Aſtragalus. *See* ancle-bone.

Blood, its motion. 151
Bones 1. their fibres 4. texture 5. marrow 7. blood-veſſels 8. ſtrength 9. of the ſcul 16. of the trunk 36. of the extremities 64, 90. number in a human body 123
Breaſt-bone 60. uſe 61
Bunched back 45

Calcis os. *See* heel-bone.
Canini. *See* teeth.
Canthus major 191. *minor* 190
Carpus 70, 86, 88
Cartilages

INDEX.

Cartilages 12
Claviculæ 57. uſe 58
Coccygis os 47, 122
Comparative anatomy of the eye 216 & *ſeq.*
Condyloide proceſs 31
Coronal proceſs ibid.
Convulſions how cauſed 14
Coſtæ. *See* ribs
Cotyloide, cavity for the top of the thigh bone 108
Cranium 15. its table 16. uſe 23
Cryſtalline humour of the eye 206
Cuboides os 100
Cuneiformia oſſa 72, 100

Dentes. *See* teeth.
Digeſtion, animal, how performed 156

Ear 224. its uſe 244
bones 20
Enarthroſis 10
Ethmoides 23
Eye 186. brow 188. lid 189
Comparative anatomy of it 216 & *ſeq.*

Female

INDEX.

Female ſkeleton to know 119
Femoris os 90, 106
Fibres of bones 4
Fibula 96
Fingers 82
Frontis os 16

Ginglymus 11
Glandulæ maxillares 176

Hand 69. *Carpi oſſa* 70. *Scaphoides* 71. *Lunare* ibid. *Cuneiforme* 72. *Orbiculare* ibid. *Trapezium* 73. *Trapezoides* 74. *Magnum* ibid. *Unciforme* 75. *Metacarpus* 78
Heel-bone 98
Humeri os. *See* ſhoulder-bone
Hyoides os 35. uſe ibid.

Jaw-bones 25, 31
Ilium oſſa 122
Inciſores. *See* teeth
Incus 21, 238
Innominatum os 61. uſe 62, 106
Joining of bones. *See* articulation

Knee-

INDEX.

Knee-pan. *See patella.*

Lachrymalia oſſa 28
Leaſt bone in the body 22
Ligaments 12
Linea mediana 184
Lunare os. *See* hand
Magnum os. *See* hand
Malarum oſſa 26
Malleus 21
Marrow 7
Maſtoide cells 240
Maxillaria oſſa. *See* Jaw-bone.
Metatarſi oſſa 101
Metacarpus. *See* hand
Motion of blood 151
Mouth 173
Muſcular motion 133

Naſi oſſa 27
Nerves 136, 141
Newton, Sir *Iſaac*, his hypotheſis on muſcular motion 136. Account of æther 143. Account of ſalt 161
Noſe 166
Number of bones in the human body 123

INDEX.

Nutrition how performed 156

Occipitis os 17
Olecranon 113 & *ſeq.*
Optic nerves 209
Orbiculare os 22, 239. *See* hand.

Palati oſſa. 29
Papillæ 179
Parietalia oſſa 18
Patella 92, 112, 114
Pericranum 6
Perioſtium ibid.
Phalanx. *See* fingers and toes 82
Plants vertue known by the outward form 270
Punĉta lacrymalia 191

Radius 67, 80
Retina 201
Ribs 58. number 59

Sacrum os 46. uſe 47, 122
Salt 161
Scaphoides os 99
Scapula 56. uſe 57

Semi-

INDEX.

Semilunaris 66
Seſamoidea oſſa 104
Sex, to know by ſkeleton 119
Shoulder-bone 64, uſe 65
Sigmoides 66
Skull. *See Cranium.*
Sound, its velocity 142
Sphenoides os 24
Spine, its uſe and mechaniſm 48
Stapes 22, 238
Sternum. *See* breaſt-bone.
Sutures 24
Synarthroſis 12
Synchondroſis ibid.

Tables of the *cranium* 16
Tapetum 221
Teeth 32
Temporum oſſa. *See Parietalia oſſa.*
Texture of bones 5
Tibia 93
Tongue 173, 178, its membranes 180
Tonſillæ. *See* almonds of the ears.
Trapezium os. *See* hand
Trapezoides os. *See* hand.

INDEX.

Turbinata ossa. See nasi ossa.

Valves of the heart 153
Vertebræ 36, their processes 38
Articulations 39, of the neck 41,50
Of the back 43, 52
Virtues of Plants discover'd by their characteristics 270
By their taste and smell 278
From their soil 288
Vision, how perform'd 210
Vitreous humour of the eye 208
Ulna 66, 89
Unciforme os. See hand.
Unguis ossa 28
Vomer 30
Uvea 200
Will, how it moves the muscles 138
Wrist. *See Carpus.*

INDEX

OF THE

PLANTS.



ADDER's-tongue Pag. 273
Agaric ibid.
Agrimony 293, 296
Alkanet 274
Almonds 287
Aloes 279
Angelica 275, 285
Aniſe 275, 285, 298
Apricocks 287
Arabian coſtus 272
Arbor vitæ 277
Arnica 296
Arſmart 280, 283
Aſh 282
Aſphodel 276

Balſam 281

INDEX.

Balſam of *Peru* ibid.
Balſam of *Tolu* 277
Barberries 283
Barley 289
Baſtard dittany 286, 296
Baum 275, 280
Bay 281
Beans 291
Betony 296, 297
Bind-weed 291, 293
Birth-wort 276, 278, 283, 296
Bitter-apple 293
Black-alder ibid.
Black-hellebore 291
Blite 275
Boleti 273
Borage 274, 284
Briony 293
Brook-lime 280, 292, 298
Bugle 282
Bupleuron 291
Burnet 292, 296
Butter 288, 290
Butter-bur 285, 292

Calamus aromaticus 280 282

Cam-

INDEX.

Camphor-tree 272
Caper 282
Caraway 275
Cardamoms 281, 282
Carduus benedictus 278, 285
Carduus Mariæ 278
Carline thiſtle 285, 291, 296
Caſſia 272
Cat-mint 275
Cedar of *Libanus* 277
Centaury 278, 296
Centaury the leſs 285
Chamomile 279, 281, 284
Cheeſe 290
Cherries 283, 287
Cherry-tree gum 284
Chervil 275, 298
Chickweed 291, 293
China of *China* 279
Cinamon 272, 281
Cinquefoil 283, 296
Citron 282, 283, 285, 286, 296
Clary 286, 298
Cloves 281
Comfrey 274, 284
Contrayerva 285

INDEX.

Coriander 275, 281, 298
Cortex Peruvianus 282
Cretan origany 280
Cubebs 281, 282
Cuckow-pint 280
Cypreſs 277

Daiſy 296
Dandelion 277
Darnel 286
Dates 285
Dead-nettle 282
Devil's-bit 296
Dill 275, 298
Dittander 280
Dittany 285
Dragon-wort 293
Dwarf-elder 298

Egyptian thorn 283, 286
Elder 284, 298
Elecampane 285
Elmetree 286
Endive 277

Feather-

INDEX.

Featherfew 296
Fennel 285, 298
Fenugreek 284, 298
Fenny crow-foot 289
Fern 274, 289
Figs 285
Fir 281, 289, 291, 296
Fleabane 284
Fluellin 282
Foreign-marjoram 275
Four cold ſeeds 284
Frankincenſe 281
Fumitory 278
Fungi 294
Fungoides 273

Galangal 272, 282
Garlic 276, 280
Gentian 285
Germander 275, 278, 281, 282, 285, 291, 296
Ginger 272, 293
Golden-rod 281, 296
Gooſberries 283
Gooſe-foot 275
Grapes 283, ibid.

INDEX.

Graſs-wort 291
Gromwel 274
Ground-pine 275, 281, 285, 291, 296
Groundſell 280
Guajacum 285
Guinea pepper 281
Gum-arabic 284
Gum-cichory 277
Gum-tragacanth 284

Harts-tongue 274
Hart-wort 296
Hellebore 294
Helmet-flower 293
Hemloc ibid, 296
Henbane 298
Herb-ſpurge 291
Herb-truelove 298
Hips 283
Honey 285, 290
Hops 298
Horehound 275, 293, 296
Horſe-radiſh 280
Horſe-tail 273, 283, 289, 293
Hounds-tongue 274, 298
Houſe-leek 280

INDEX.

Huſky-creſſes ibid.
Hyſſop 275, 293, 296

Jeruſalem oak 281
Jeſſamine 286
Indian cane 272
Jubebs 285
Juniper 281, 285, 291, 296

Ladies-mantle 296
Larch-tree 277
Lavender 275, 280
Lentils 291
Leopards-bane 296
Lillies 294, 298
Lilly of the valley 286
Lemons 283
Linſeed 284
Liquorice 285
Liver-wort 273
Lovage 275, 298
Lung-wort 274, 281, 291, 296
Lycoperda 273

Mace 281
Maidenhair 274, 282, 289

Mala-

INDEX.

Malabathrum 272
Mallow 284
Mandrake 286, 298
Marjoram 280
Marſh-mallows 274
Marſh-mary-gold 280
Marſh-parſley 289
Maſter-wort 275, 285
Maſtic 281
Maudlin-broom 296
Meadow-ſweet 286, 298
Medlars 283
Melilot 284, 298
Mercury 275, 299
Milk 290
Milk-wort 296
Mint 275, 276, 280
Myrtle 289
Moon-wort 273
Mother of time 289
Mountain calamint ibid.
Mouſe-ear 296
Mug-wort 276, 296
Mullen 284, 298
Muſtard 280

INDEX.

Nettles 299
Nightſhade 286, 298
Nutmegs 281

Oak 283
Onions 276, 280
Orach 275
Oranges 282, 283, 285, 286
Oſmund 273
Ox-tongue 284, 298

Parſnips 275
Paſque-flower 294
Pauls-betony 296
Peaches 287
Peaſe 291
Pellitory 275, 284, 296, 299
Peony 286
Pepper 280
Periwinkles 291
Pine-tree 277, 281, 289, ibid. 291, 296
Pitch-tree 291
Plantain 283, 289
Polypodium 274
Pomegranate 283
Poppies 284, 286, 298

INDEX.

Poplar 298
Primroſe 286, 289
Prunes 287
Pulſatilium 291
Purſlane 284

Quinces ibid.

Radiſhes 292
Raiſins 285
Rhubarb 279
Robert of the wall 281
Rocket 280
Roman Chamomile 282
Roſe 286
Roſemary 275
Roſin-tree 277
Rue 285, 294
Rye 289

Saffron 284, 286, 298
Sage 275
St. *John*'s-wort 281, 296
Sanicle 291, 296
Sarſaparilla 285
Saſſafras 282

INDEX.

Savin 281
Saxifrage 291
Scabious 282, 285, 296
Scordium 285
Scurvy-graſs 280
Sea-aloes 293
Sea-onion 291
Sea-orach ibid.
Sea ſcurvy-graſs ibid.
Sebeſtens 285
Sena 293
Smallage 275, 293
Snake-root 281, 285
Soap-wort 298
Sorrel 283
Southernwood 276, 280, 296
Sow-bread 293
Spikenard 281
Spinage 275, 299
Spleen-wort 282
Spurge 293, 294
Spurge-laurel 291
Stachas 296
Stag's-tongue 282
Strawberries 283
Succory 277, 279, 296

INDEX.

Sugar 285
Sun-dew 293
Swallow-wort 296
Sweet-almonds 284
Sweet-broom 291
Sweet-cane 280, ibid.
Sweet-majoram 275
Sweet-prunes 285

Tamarinds 283, 285
Tamariſk 282
Tanſy 276, 278
Tart-apples 283
Tea 282
Thorn-apple 286, 298
Time 296
Tobacco 286, 298
Tormentil 282, 283, 289, 296
Turpentine 281

Valerian 281, 285, 298
Vervain 297
Vetches 291
Viper-graſs 277, 296
Violets 284, 291

INDEX.

Wake-robin 293
Wall-flower 298
Wall-rue 274
Wall-ſage 296
Water-creſſes 280, 292
Water-caltrops 294
Water *flower-de-luce* 293
Water-pepper 293
Water-plantane 294
Wheat 289
White-lillies 284, 286
Wild-baſil 296
Wild-bugloſs 291
Wild-carrot 275, 296
Wild-marjoram ibid.
Wild-time ibid.
Wine 290
Winter-bark 282
Winter-cherries 291
Winter-green 296
Wolf's-claw 273, 283
Wood-ſorrel 278, 283
Wormwood 278

INDEX.

Yarrow 284
Yellow-ſtuados 291

Zedoary 272, 282, 285
Zerumbeth 272

IN-

INDEX

OF

DISEASES.

ABSTERGENTS Page 277
Anodynes 286, 297
Anthelminthics 276, 293
Appetite loſt 279
Apoplexy 280
Aſtringents 273, 274

Blood, its circulation to promote 276, 285, 297
Bowels to relax. 275

Cachexy 279, 281
Catarrh 284
Cathartics 293
Cephalics 275
Chronic diſeaſes 296
Circulation of blood to promote 276, 285, 297

INDEX.

Convulſions 286
Cough 284
Crudities to remove 273, 276, 280

Deobſtruents 273, 297
Diaphoretic 276, 279, 285
Digeſtion weak 281
Diſcutients 276, 284
Diuretic 276, 277, 293
Dryers 273

Emmenagogues 279
Emetics 293
Emollient 283
Epilepſy 280

Fevers intermittent 281, 282
Fluxes to ſtop 282

Gonorrhœas 281, 284

Healing of wounds 274, 282
Hypochondriack melancholy 279

Imbecillity 280
Intermitting fevers 281, 282

INDEX.

Itch 285

Leproſy 285

Mollifiers 298
Mortification 280

Narcotics 286, 297, 299
Neurotics 275, 286

Obſtructions 273
Obſtructions of the reins 281, 283

Palſy 280
Purgatives 293

Quartan 279

Rheumatiſm 280

Scurvey 279
Sharp humours 274, 275, 279
Stomach bad 279, 280
Stone 283, 285
Strangury 284, 285
Strengtheners 297

Strengthen-

INDEX.

Strengtheners of bowels 274

Teneſmus 284
Thirſt to quench
Traumatics 274, 282
Tumours 279

Viſcid humours to incide 273, 277, 279, 280
Ulcers 279, 284

Weak digeſtion 281
Whites ibid.
Wind to diſcuſs 276
Womb 280
Wounds to heal 274, 282

FINIS.

MVSEVM BRITANNICVM